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OCCUPATIONAL PSYCHOLOGY

JANUARY, 1965 VOLUME 39 NUMBER 1

On the Allocation of Functions between Men and Machines

By ALPHONSE CHAPANIS

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Baltimore, Maryland

INTRODUCTION

NUMEROUS writers agree that one of the first and most important problems in man-machine system design has to do with the allocation of functions between men and machines (See, for example, Bamford 1959; Chapanis 1960a, 1960b and 1961; Gagné 1962; Lomov 1963; Morgan, Cook, Chapanis, and Lund 1963; and Sinaiko and Buckley 1961). This problem can be viewed from several points of view and there is a considerable amount of uncertainty about how allocation decisions can best be approached (See, for example, Fitts 1962, and Jordan 1963). In my paper this morning, I shall try to do four things: (1) Describe the nature of the allocation problem, (2) Say something about the approaches that have been taken to this problem in the past, (3) Give you a few of my views on the contemporary status of the problem, and (4) Suggest a strategy for dealing with it.

THE NATURE OF THE PROBLEM

Industrial engineers and operations researchers use the words "allocation model," "allocation problem," or "assignment problem" to refer to those situations in which they want to combine activities and resources so as to maximize the effectiveness of a system (See, for example, Churchman, Ackoff, and Arnoff 1957). The kind of allocation problem with which we are concerned is a special case of this more general one. However, you will not find our problem discussed in textbooks of industrial engineering or operations research because our problem has no neat mathematical model and no elegant mathematical solution.

The nature of our allocation problem can be described very simply. In planning any man-machine system, an engineer can usually think of many alternative ways of designing it (See Chapanis 1961, for a specific example). These alternative designs may vary in a number of respects. For example, the designer may use different numbers and sizes of machine units: He may design one very large machine or several smaller ones to do exactly the same thing. Or he may use different kinds of linkages — mechanical, hydraulic, or electrical — between various parts of the system. Also among the things which a designer may vary is the number of people in a system and the functions which these people perform.

Let's take a specific example. Think of an industrial engineer who is designing a system to handle checking accounts in a bank. He could, conceivably, design the system in such a way that virtually all of the functions were performed by people. Tellers would receive the checks, sort them into their proper accounts, enter the amount of each check into the appropriate ledgers by hand, compute the bank balances by mental arithmetic or with the help of a simple device like an abacus, prepare monthly statements by hand, and mail off monthly statements to account holders. There are, in fact, some banks in the world which still operate in essentially this way.

A somewhat more complex type of system might provide the clerk with machines (for example, adding machines) to assist him in his computations, although he might still make entries and do all other operations by hand. Still more complex would be a system in which machines not only assisted the clerk in making his computations but printed out the bank balances on the appropriate forms. Next we might consider a system in which all of the accounts and all of the checks carry an identifying number such that the numbers are read and sorted by machine into the appropriate accounts. Further we might consider a system in which the checks are not only sorted into accounts automatically, but in which balances are computed automatically by machine, the amounts of the checks and balances are printed out on the appropriate statements, and the statements are addressed and mailed out to the account holder, all by machine.

Each of these alternatives is realistic and workable. Further, I have discussed them in an order which represents increasing amounts of machine participation and decreasing amounts of human participation in the system as a whole. Incidentally, although I have mentioned only five different systems here, some engineers (See, for example, Amber and Amber 1957) distinguish as many as ten different levels of automaticity in man-machine systems. The important thing to notice, however, is that the functions which human operators perform in each of these systems is different.

When we ask about the allocation of functions between men and machines we are asking essentially: What functions of the system should be assigned to men and what to machines? Or, what kinds of things can and should human operators be doing in a man-machine system? These are fundamental questions about man-machine system design. They are important because decisions about the allocation of functions influence all of the later design thinking about the system. In fact, some decisions about the allocation of functions should ideally be made before the first blue prints are drawn and before the first components are built.

EARLIER CONCEPTIONS OF THE MAN-MACHINE ALLOCATION PROBLEM

If we look at what various writers have said about the way in which functions should be allocated to men and machines we find little of direct and immediate help. Usually one finds a general discussion of the kinds of things that people do in man-machine systems and statements about some general characteristics of man as a component in man-machine systems. Often, too, one finds some general statements about the kinds of things people can do better than machines and vice versa (See Table 1 for an example).

Comparisons such as these serve a useful function, but only in the most elementary kind of way. I think they are useful primarily in directing our thinking towards man-machine problems and in reminding us, in general terms, of some of the characteristics that men and machines have as systems components. But when we come face-to-face with the practical realities of assigning functions in a genuine man-machine system, we find such general statements of almost no help at all. Why is this the case? The answer, I think, lies in the following:

TABLE 1: A HIGHLY ABBREVIATED LIST OF SOME OF THE RELATIVE ADVANTAGES AND DISADVANTAGES OF MEN AND MACHINES (FROM CHAPANIS 1960b)

MEN	MACHINES
Able to handle low probability alternatives, i.e., unexpected events.	Difficult to program. Difficult to anticipate all possible events and so virtually impossible to program for all such contingencies.
Able to perceive, i.e., to make use of spatial and temporal redundancies and so to organize many small bits of information into meaningful and related "wholes."	Zero, or very limited, ability to perceive. "Organization" has to be elaborately programmed, which is difficult to do because of the many alternative ways organization can be formed from elements.
Possess alternative modes of operation. Can accomplish same or similar results by alternative means if primary means fail, or are damaged.	Alternative modes of operation limited. May break down completely when partial injury or damage occurs. Not able to regenerate or heal.
Limited channel capacity, i.e., there is a maximum amount of information that can be handled per unit time, and this is small.	Channel capacity can be made almost as large as desired.
Performance subject to decrement over fairly short time periods because of fatigue, boredom, and distraction.	Behavior decrements only over relatively long periods of time.
Comparatively slow and poor computers.	Excellent and very rapid computers.
Flexible; can change programming easily and frequently. Very large number of programs possible.	Relatively inflexible. Flexibility in kind and number of programs can be achieved only at a great price.

1. *General man-machine comparisons are frequently wrong*

Like most general statements, the ones that compare men and machines are wrong, or at least misleading, in particular instances. Consider, for example, the statement that machines surpass people in computational ability. In general, I think most of us would probably agree with this. The giant digital computers with which we are all familiar clearly do fantastic computational feats at speeds which are incredibly fast by mortal standards. Yet does this mean that we should always use a digital computer, or any kind of a machine, when there are computations to be done in a system? Not at all. Many kinds of computations in man-machine systems are still most logically and sensibly done "in one's head." For still other kinds of computations, the most sensible implements to provide are a pencil and a pad of paper. I think it also correct to say that digital computers are not likely to supplant an engineer and his slide rule for many kinds of tasks.

Numerous exceptions of this same character can be found to all of the general statements contained in Table 1. To sum up, then, when we come to apply general rules about human or machine characteristics to particular functions in real man-machine systems, we often find that the rules are wrong or misleading.

2. *It is not always important to decide on a component which can do a particular job better.*

The second reason why general statements such as those in Table 1 are often not useful in practical situations is that the systems engineer is not necessarily concerned with which component is the better of the two for a particular function. He may often be interested only in the question: Is the component good enough to do the job? Let me illustrate this point with the following example.

There are in the United States a large number of super-highways — highways which have from four to twelve lanes engineered with carefully designed curves, grades and crossings so that they may carry a large volume of traffic (up to 10,000 vehicles per hour) at average speeds of 60 or more miles per hour (97 or more kilometers per hour). Some of these highways are toll roads — that is, the motorist must pay a fee or charge every time he travels on them. There are two principal methods used to collect these tolls. One method makes use of human toll collectors who accept money from the motorist, make change if necessary, deposit the money into a collection box or register, and signal the motorist that he may proceed. The other method makes use of a machine. The motorist drives up to a collection bin and drops his money into the machine. The coins may be in any combination whatsoever that adds up to the required toll. The machine counts the money, and if the correct amount has been received, it switches a signal from red to green to tell the motorist that he may proceed. After the motorist has passed over a treadle, the machine resets its own cycle for the next automobile.

If you compare the two components — the human versus the machine toll collector — you find that the human can do the job much better in certain respects. Not only can he make change (which the machine does not do), but he can take care of more automobiles per hour than the machine can. But does this mean that for the system as a whole we should use only human toll collectors? Not at all. Even though human toll collectors are better, the machines do the job well enough. In fact, from the standpoint of the operation of the system as a whole, the machines have enough other advantages to make up for their deficiencies.

3. *General comparisons between men and machines give no consideration to trade-offs.*

The last sentence above suggests the third reason why general statements about men and machines are often of little help. In the practical business of designing systems, the engineer always has to consider trade-offs — the values of using a particular kind of component versus the costs of using that component. Incidentally, I use the word "costs" here in its most general sense to refer to all the disadvantages that come with a particular component. The cost-value problem is perhaps illustrated most easily in the field of space exploration. Suppose that we are considering a vehicle to do scientific studies on the surface of the moon. I think most of you would agree that we can plan to do many more kinds of experiments with our space vehicle if we have a well-trained astronaut on board than if we do not. A human is generally much more flexible, that is, he can do many more different kinds of things, than a machine. This advantage, however, carries with it a terrific penalty, and that penalty is weight. To enable the astronaut to live we have to provide him with a carefully controlled artificial environment, food, water, and all other things necessary for his survival. This means that much of the weight of the space vehicle is taken up with materials which serve no purpose other than to keep the astronaut alive.

In such a situation, one question the systems engineer wants to know is this: Is it better to design a vehicle which contains a human operator and less equipment, or is it better to design a vehicle which has no human operator and more equipment aboard? Comparisons such as those given in Table 1 unfortunately never help us to solve these trade-off problems.

SOME CURRENT VIEWS ON THE DIVISION OF FUNCTIONS BETWEEN MEN AND MACHINES

I should like now to turn to the third part of my paper and summarize for you a few of my thoughts about the problem of assigning functions to men and machines. In particular I want to make three generalizations which do not seem to have been expressed before.

1. *The allocation of functions in man-machine systems is determined in part by social, economic, and political values*

The first general statement I should like to propose is that decisions about the assignment of functions in man-machine systems are always influenced to some extent by social, economic, and political values. These are usually unstated and implicit. Unfortunately, we in the United States often forget about these hidden assumptions because we know, or think we know, what our own social and economic values are. Let me see if I can illustrate what I mean by a simple example.

Imagine that we are considering the design of a mail-handling system for a new post office. The question arises whether the mail should be sorted and cancelled by people or automatically by machine. The proper answer to this question depends on a great many things, among them the cost of human labor, the attitudes and stereotypes which labor has to monotonous and repetitive work, the value to the national economy of having these operations done by people instead of by machines, the availability of the machines and spare parts, the availability of skilled maintenance technicians to service the machines and keep them operating, the volume of mail that is normally handled by the post office, the attitudes of the citizens towards postal services and government work, and so on. Given certain conditions I think it is quite possible that we might decide to have these jobs done by people; given other conditions we would undoubtedly conclude that these jobs should be done automatically. In any event, it is fairly clear that postal and communications systems which work well in some countries are not at all appropriate for other countries at the present time (See, for example, The International Bank for Reconstruction and Development, 1961 and 1962).

In its broadest terms, then, I am suggesting that man-machine systems are not entirely culture free. Failure to recognize this fact can lead a systems designer into making some serious errors.

2. *Assignment functions must be continually re-evaluated*

The second generalization I want to make is that assignment decisions are not fixed and immutable. These decisions are always made at some point in time, and relative to a particular state of development of engineering art. Not so many years ago it would have been completely meaningless to consider the possibility that we should use a machine to "read" numbers on checks and sort the checks automatically into their proper accounts. Today this question is not meaningless, because we do, in fact, have machines which can do precisely that. On the other hand, it is trivial to ask today whether we could use a machine to read the addresses on letters and sort the letters automatically according to their destinations. There simply aren't machines available to read all of the kinds of handwriting that people use (See Figure 1). Twenty years from now, however, this might no longer be a meaningless question. There is much work in progress on machines to read handwriting and I am confident that these efforts will eventually be successful enough to merit serious consideration.

Designing a system is something like writing a book. Unless you draw a line in time and work against that deadline, you will never complete either job. This continual re-evaluation means, to paraphrase a common adage, that a human engineer's work is never done.

3. *Many of the difficulties experienced in making allocation decisions arise from engineering uncertainties*

Those of us who are in the human sciences often feel insecure and apologetic about our own science and subject matter. We often feel that it is our ignorance about human behavior which is responsible for the difficulties we have in making decisions about man-machine system design. If you have ever worked closely with systems engineers, however, you soon come to realise that there is much uncertainty on the machine side of the equation as well. In the first place, there is no such thing as *a* system design process, precise and specifiable (See Kossiakoff 1960, and Salzer 1961, for example). Instead, systems designers often proceed with much trial-and-error just as anyone else does. In addition, although I realize it is dangerous to make a generalization about this point, I have the feeling that engineers are sometimes overly optimistic in their predictions about what they can do with their machines. As a result, the final products frequently fall short of what had been anticipated for them.

For these and other reasons, one usually finds that allocation decisions are not fixed even for a single system. Instead, we find the engineers making a series of approximations, modifications, and changes during the development of the system as they discover that certain things can or cannot be done with the machine components. These, in turn, require a continual re-examination of the roles which the men and machines are to play in the system.

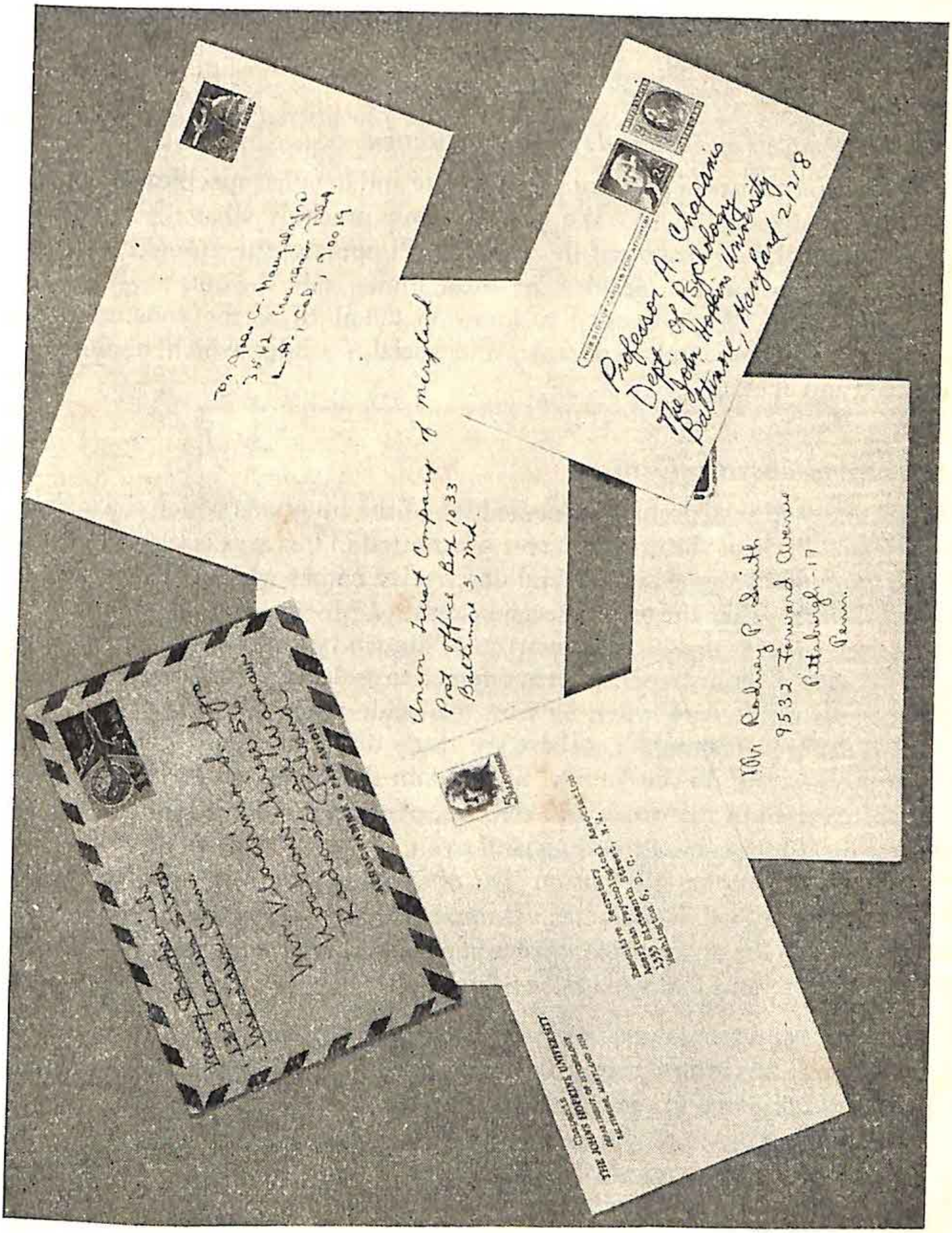
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Figure 1: Some of the kinds of material that a mail handling system must be able to cope with.

A STRATEGY FOR MAKING ALLOCATION DECISIONS

Finally, I want to say a few words about what I consider to be the best strategy for making decisions about the division of labor between men and machines in systems. Let me say at the outset that I shall not give you any simple method for making these decisions infallibly because I do not believe that any such method exists. Rather I think that the best I can do is to give you a general approach to the problem.

1. *Prepare a complete and detailed system specification*

The first step consists of preparing a complete and detailed specification of the system (See Chapanis 1960b). We need to know precisely what the system is supposed to do, the environment in which it will operate, the inputs it will receive, the operations it will perform on these inputs, and the outputs it is supposed to produce. We also need to know in detail all of the constraints — engineering, environmental, economic, and social — under which it must be constructed and operated.

2. *Analyze and list system functions*

The second step is to prepare a detailed list of the functions which the system is to perform. Perhaps the greatest error committed in this area is that psychologists are too fond of vague and general descriptive names which are of little use in practical work. Take the term "decision-making," for example. Psychologists use this term to refer to a broad spectrum of human behaviors. What a subject does in a choice-reaction experiment is referred to as decision making. Similarly, what an industrialist does when he tries to decide manufacturing strategies is also called decision-making. Yet these are vastly different orders of complexity. A machine can often do the former, but seldom the latter. Other vague terms that are often used in this work are: sensing, perceiving, monitoring, shunting, short term memory, scanning, coding, and so on.

The key to success here is that our list of systems functions must be highly specific and operational in character. It must describe the particular things that need to be done. As an example, take a mail-handling system for a post office. What are the functions that need to be performed? They are such things as:

a. Letters and cards must be sorted into certain size ranges.
b. Letters and cards within a size category must be stacked with the postage stamps oriented in a particular direction.
c. Mail must be checked to insure that it is carrying sufficient postage.
d. Stamps must be cancelled.

And so on.

3. *Make tentative assignments for each function*

The next step consists of assigning each of the jobs to be done to a man or machine, or, what is much more common, to some combination of a man and a machine. These decisions are made in terms of assignments that will be best for the operation of the system as a whole, given all of the constraints under which it must be constructed and operated.

With a detailed list of functions before us, assignment problems become much easier. Sometimes, in fact, they are immediately obvious. Consider, for example, the function of checking the mail to see that it has the correct postage. This has to be a human function in part. No one knows how to build a machine to read the values of postage attached to an envelope.

Sometimes, of course, assignment decisions have to be made simply on the basis of our best judgment of what a man or a machine can, or cannot, do, or on the basis of our experience with similar systems which have been constructed in the past.

Finally, some decisions may have to wait for experimental evidence or the results of other types of studies to assist us in our decisions. It is unfortunate that the kind of information the human engineer, or the system engineer, needs for these decisions is seldom to be found in textbooks of psychology. An example of the kind of data the engineer needs is shown in Figure 2. This comes again from the field of space exploration. It compares the reliability of completely automatic systems of different levels of redundancy, against a single redundant system in which one of the components is a well-trained man. Notice how much more reliable the system is when we have a man provide the redundancy in the

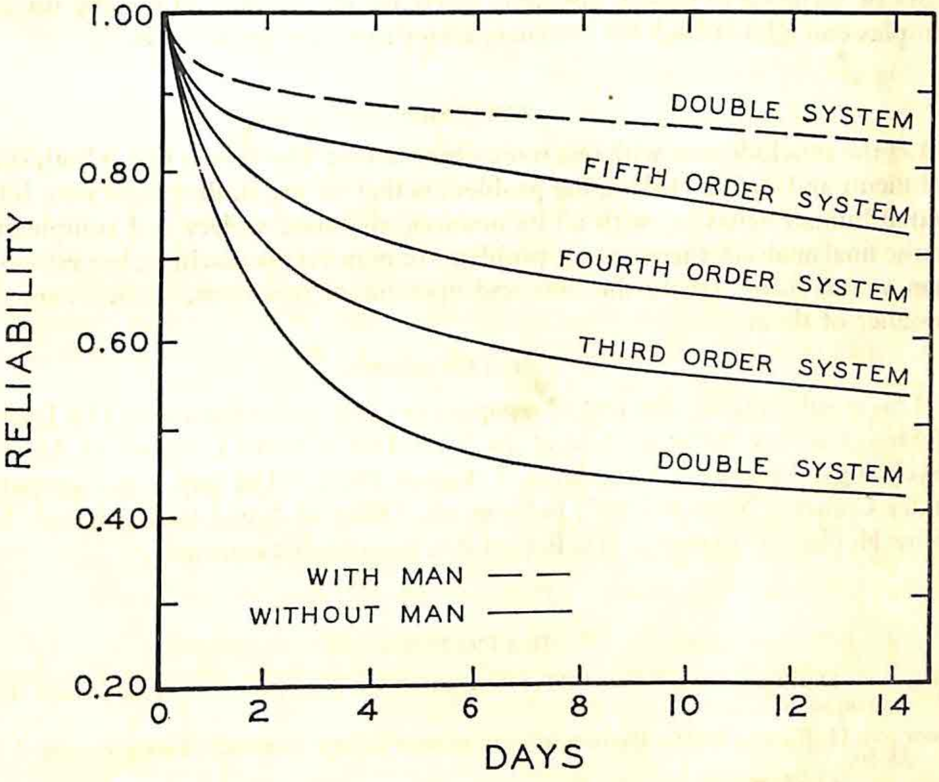

Figure 2: The reliability of a double redundant navigation system in which one of the redundant components is a man (dashed line) as compared with the reliability of systems with various orders of redundancy in which all components are machines (solid lines). (After Grodsky 1962.)

system. This is due, of course, to the flexibility which man brings to the system, but the important thing to notice is that the vague word *flexibility* has been translated here into a highly meaningful, systems-relevant criterion.

4. *Evaluate the sum total of functions which have been assigned to man*

After individual tasks have been allocated to men and machines or to some combination of them, the sum total of the human functions must be carefully assessed to see that they make up a job which is interesting, motivating, and challenging to the human operator. Men, unlike machines, work best at some medium level of difficulty. If the job is too difficult, a man may give up in despair or break down under the strain of trying to do it. On the other hand, it is not good to design a system in such a way that the human operator does nothing more than push a button occasionally. Under these circumstances, the operator soon realizes that he is being used inefficiently and he may become indifferent or inattentive, go to sleep, or even actively rebel against the system. This means that individual functions which might be done better by machine should sometimes be assigned to human operators solely for the purpose of making the job complex enough to match the human operator's psychological needs.

CONCLUSION

Let me conclude now with one more observation: The reason this is both such a difficult and such a challenging problem is that we are dealing here with integrated human behavior, with all its nuances, richness, variety and complexity. In the final analysis, these are not problems of man versus machine, but rather of man versus man — man, the user and operator of machines, versus man, the designer of them.

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Adapting Tests to the Cultural Setting: A Comment

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THE article by Schwarz (1963), on which this is a comment, is one of considerable importance for test users and constructors, whether they are operating in western or non-western cultures. While there is much to commend in the article, there are some debatable issues and some points of general implication which concern the sources of variance in test scores that may be found in Africa and elsewhere and the hypothetical reasons for them. So that the reader may follow the trend of both articles more clearly, the discussion follows the lines laid down by Schwarz.

In his review of the testing literature, Schwarz rightly points out that the development of paper and pencil tests in Africa and other non-western societies is only now going forward on a large scale. Although this is so, it certainly does not follow that the American Institute for Research (AIR) project he mentions was 'the first major effort' in the field. This is a minor point in relation to the whole discussion, but this lack of historical perspective is unfortunate, and a fault that is gross in his first report (Schwarz 1961).

A much earlier 'major effort' was the work following the African campaign in the years 1944-45 by a British Army team directed by Lt. Col. A. Macdonald (1944-45). This team, in the short time of one year, adapted, constructed, validated and subjected to factorial studies, (See Vernon, 1961a, p. 106) no fewer than 14 tests of technical skill and general ability for use with African recruits from East and West Africa with various degrees of literacy. Over 2,000 men were tested. Some were performance tests, but others were paper and pencil. They foreshadow much of our present efforts and invoke the basic principles of test presentation that have been rediscovered independently in the past ten years by many scientists. Also worthy of note, surely, are the tests suggested for trial at the CCTA meetings mentioned by Schwarz. These are Raven's *Progressive Matrices*, 1938 and the specially standardised Africa tests of the National Institute for Personnel Research (NIPR) called *Spiral Nines* and *Normal Level Battery*. Although events denied West Africa the use of South African Tests, they have been studied and applied intensively in East (Silvey, 1962, 1963) and Central (Irvine, 1962, 1963a) Africa, and have been used in conjunction with AIR tests *Boxes*, *Figures* and *Mechanical Information* in Northern Rhodesia (MacArthur, Irvine and Brimble, 1964). Similarly, the practical studies of Vernon (1961b) in the West Indies and Wantman (1962) in Malaya might have been mentioned as examples of growing application of selection tests outside Europe and America, under conditions comparable to those experienced in

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Africa. One sympathises a great deal, however, with the isolation, sometimes by distance and sometimes through circumstance, of scientists in Africa and the tendency to be unaware of recent developments in the field because of preoccupation with the job in hand. These references, it is hoped will supplement those already given and enlarge the growing bibliography, most of which has already been collected by Hopkins (1962), of test application in Africa.

This apart, these are general issues which focus on the meaning of test scores derived from African populations with their implications for testing in general. They are the variance in test scores due to the presentation and format of tests, the variance due to environmental factors, and the variance due to individual strategy within a test situation.

First Schwarz (p. 675) stresses strongly the great number of learning tasks required from the unsophisticated test-taker who has to understand the test format, learn to record the answers and recognise during the test the types of items presented to him in any pre-test instruction and practice. These learning operations may not be central to the specific ability being tested, but they are learning operations and it can be noted that as such they could produce variance that although 'confounding' to a 'pure' test score, are nevertheless present according to the extent of understanding reached by the people tested. Although experience in central Africa, involving the testing of over 5,000 children and adults confirms that this should be reduced as far as possible when 'pure' measures are sought, situations can be conceived where the variance that might be introduced by different types of test presentation could be useful variance, depending on the criterion.

Experiments by the Centre D'Etude Professionelle (1958) Lloyd and Pidgeon (1961), Silvey (1962) and Irvine (1962), for example, show that variance can be introduced or excluded when different methods of introducing a test are used. Particularly useful for such experiments is Raven's *Progressive Matrices*, 1938, a non-verbal test involving formal operations, that could be presented in at least two different ways, one of which, using visual aids (such as charts and diagrams) to communication, could be a 'culture-reduced' (MacArthur, 1962) test of general and immediate non-verbal intellectual capacity, and the other, when simple demonstration not involving elaborate apparatus is used, a measure of learning and adaptation plus this. The second type of test score is clearly of different *meaning* from the first because of different test presentation and where the criterion was such as required a mixture of both 'adaptability' and power, considerable economy of effort and time could result through the use of such a test in this way. Indeed, whenever a criterion is regarded as 'coarse' either because of its categories or the personnel doing the assessing, a certain blanket 'coarseness' in the test might provide considerable insight into the criterion, knowing the proportions of variance attributable to the total test situation. A big step forward, indeed, would be the programming of instructions for tests so that the sources of variance could be experimentally controlled as far as possible.

This suggestion would also be applicable outside Africa, despite Schwarz's (p.675) assertion that test constructors have 'justifiably' assumed that the process of learning the mechanics of how to take a test does not appreciably affect the meaning of test scores. Surely Vernon's (1962) conclusion that even in Western societies, when dealing with relatively homogeneous groups and testing 'complex' concepts the method of testing may have more effect than is generally realised, is an important one. Vernon's final point, that poor differential prediction may be due to variance introduced by the method of testing is as crucial, when one is dealing with a criterion that has had as rigorous an investigation as the test itself as it is undesirable, but when there may be doubts about test or criterion, then some device other than careful test presentation and test method, may help improve prediction.

There is at present, much interest in an ongoing study* that, realising the differences in approach by individuals to any testing situation attempts to identify people for whom the test does not produce test scores that are equatable in meaning with those expected from the test as designed. People who have a non-predictable or extreme approach to a test, if they are identified, can thus be screened out from those for whom the test has meaning consistent with its original standardisation. Those that remain then represent a cohort that lends itself to more precise prediction. Such a study is necessary for testing in Africa, and also for testing in situations such as Vernon describes, where low validities may be a consequence of individual perceptions and approaches.

Testing in Africa, then, has sharply outlined many of the assumptions made about test method. It would be shortsighted to regard African experience as unique. Instead, one should see in it a means of isolating these assumptions and examining them afresh, with populations for whom testing is a new experience, in order to increase our knowledge about tests and their uses in circumstances where variance due to test administration and method may have previously been taken for granted.

The second important contribution made by Schwarz concerns his discussion on the construction of tests in relation to the local environment. Here again, his observations underline the importance of recognising and identifying sources of variance in test scores due to familiarity or unfamiliarity with the content, in cultural terms, of the test items: not necessarily, either, to reduce individual differences on this score, but to increase them, should the criterion demand. His general principle of seeking in the environment examples of the concepts to be tested in order to reduce such variance, if it is not required, is admirable, but his example (pp. 676-7) of a test of *Mechanical Information* is perhaps unfortunate, since it illustrates how important it is not to assume that a test designed to test quality X, because it looks like a test of quality X, is in fact such a test. This test called *Mechanical Information*, and tests *Boxes* (a perceptual test in three dimensions) and *Figures* (a hidden shapes test) were used in the Northern Rhodesia Mental Ability Survey, 1963, alongside Raven's *Progressive Matrices* and NIPR *Spiral Nines* and the aptitude and attainment tests of the *Normal Battery* to study concurrent validity in a technical college and in a printing works among other situations (see Tables 1 and 2, reproduced from MacArthur, Irvine and Brimble, 1964) using samples of carpenters, bricklayers and mechanics trainees and machinists and bookbinders respectively.

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* By Mr. A. O. H. Roberts, of N.I.P.R. Johannesburg, with whom the writer was privileged to share his ideas.

TABLE 1: Correlation Matrices for Hodgson Training College, Lusaka, Northern Rhodesia, 1963.

TESTS	21			22			23			24			25			26			27			28			29			30		
Year of Study	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
21. Prog. Matrices	—	—	—																											
22. NIPR Mental Alertness	52	62	70	—	—	—																								
23. NIPR NB Comprehension	47	43	53	64	50	49	—	—	—																					
24. NIPR NB Vocab.	22	33	55	37	48	57	45	45	35	—	—	—																		
25. NIPR NB Spelling	19	01	31	35	28	31	28	23	48	32	25	32	—	—	—															
26. NIPR NB Compnt.	13	04	18	25	27	28	15	12	19	12	-09	18	19	24	02	—	—	—												
27. AIR Boxes	08	35	39	25	30	44	06	10	08	-18	05	10	-10	00	-02	00	20	26	—	—	—									
28. AIR Mech. Inf. 1 & 2	46	44	59	42	40	64	36	08	11	20	31	51	16	00	13	27	-27	17	45	29	28	—	—	—						
29. AIR Mech. Inf. 3	48	53	47	37	45	39	36	16	12	24	25	41	33	-04	19	12	-12	10	-05	22	17	46	66	55	—	—	—			
30. AIR Figures	40	34	48	26	31	35	19	29	19	15	11	22	14	-11	00	26	18	12	09	16	25	37	06	33	24	00	23	—	—	—
31. TRADE EFFICIENCY CRIT.	21	13	37	35	42	25	26	-06	18	18	07	10	23	-09	08	-09	30	25	04	48	31	24	17	38	30	16	25	18	19	32

Beta Weights

(in continuation)

TESTS	Set 1			Set 2			Set 3		
Year of Study	1	2	3	1	2	3	1	2	3
21. Prog. Matrices	-11	-30	17				04	-17	-08
22. NIPR Mental Alertness	32	63	-23	32	32	-13	38	48	39
23. NIPR NB Comprehension	12	-28	16						
24. NIPR NB Vocab.	-02	04	-20						
25. NIPR NB Spelling	10	-23	05						
26. NIPR NB Compnt.	-26	15	17				-19	18	20
27. AIR Boxes	-10	38	18	-11	40	22			
28. AIR Mech. Inf. 1 & 2	15	-01	39	16	-01	33			
29. AIR Mech. Inf. 3	13	00	04						
30. AIR Figures	11	06	15	00	03	20			
31. TRADE EFFICIENCY CRIT.	54	74	63	38	57	47	40	49	42

Multiple R

The correlation between tests for each of the three years of study at the College are shown side by side: Year 1 N = 61, Year 2 N = 57, Year 3 N = 76. All decimal points omitted.

TABLE 2: Correlation Matrix, Beta Weights and Multiple Correlation.
Publicity Print Services, Lusaka, 1963,
Machinists and Binders. (N=29).

TESTS	18	19	21	23	24	25	26	27	28	29	30		Beta Weights
18*. S. Nines Verbal	—												—64
19*. S. Nines Abstract	60	—											29
21. Prog. Matrices	62	88	—										—43
23. NIPR NB Compr.	76	51	65	—									10
24. NIPR NB Vocab.	86	67	71	80	—								68
25. NIPR NB Spelling	65	42	40	59	70	—							24
26. NIPR NB Comput.	57	55	54	52	74	58	—						—03
27. AIR Boxes	28	21	33	13	32	10	13	—					10
28. AIR Mech. Inf. 1+2	62	60	63	42	50	30	25	39	—				36
29. AIR Mech. Inf. 3	64	68	76	57	63	43	37	34	78	—			19
30. AIR Figures	54	64	69	38	48	21	41	47	66	59	—		24
Trade Efficiency	57	63	63	51	68	54	49	41	66	68	58	R	85

* Spiral Nines Total correlated .6 with criterion

It will first be seen that there are consistent signs of overlap between the tests of general ability and other tests. The tests of *Spelling*, *Computation*, *Boxes* and *Figures* do show some signs of independence, but the correlations between the general ability tests and the test of '*Mechanical Information*' cannot be ignored while the intercorrelations between the parts of the *Mechanical Information* Test also leave room for variance not expected by the name of the test. In fact, were the tests of *Mechanical Information* re-named 'general intellectual ability' their correlations with each other and with other tests would bear the interpretations that such names would imply. These signs are further emphasised by studying the Beta weights of Tables 1 and 2 in the multiple correlation with the criterion of trade efficiency. They show the occasional interchangeable suppression effect between *Mechanical Information* and general ability tests or the way in which if by chance one of the tests takes a large share of the variance, the other type adds little. So that it is difficult not to conclude that these tests have a lot in common with the criterion that is not 'mechanical information.' We have, then, variance in test scores that is not concerned with test presentation or method, but in test content; and some of the variance is of an unexpected nature if one assumes that a test called 'mechanical information' is testing this.

It must be clear that Schwarz's claim that the test predicts technical 'success' is not being called in question. The test does achieve that, but no better, for these groups, than tests of a general nature. We conclude that the test has considerable 'global' variance for these samples; and that global tests here predict technical skills. Now follow some possible reasons for this.

Why 'mechanical information' tests constructed in Africa may be related to 'general ability' tests, and the latter predict trade efficiency may be deduced from observing the African environment, and considering its effects on individuals born into it. Examples of mechanical principles abound in Africa, but the conscious formulation of them in terms of 'laws' and the incorporation of them into the language as technical concepts is a western notion, and the vernacular languages contain little evidence of the conscious awareness of either need. When these tests are presented to African students, their task appears not so much the calling forth of perhaps unconsciously learned and observed mechanical principles, as the seeing of relationships between a series of pictures or representations in a test and the eduction of the relevant correlates by induction or deduction. The environment, indeed, may never have consciously communicated these principles to its inhabitants so that their first evoked realisation is in a test situation in a second language. The test may then not test acquired knowledge so much as the ability to discern relations in context. It may certainly predict technical skill, but only partly for the reasons assumed. The test score meaning may be a complex, and not a simple one. In fact, until its meaning becomes precise, it should be considered an 'X' score (Irvine, 1963a).

This test, then, may have elements of general ability, but we must also consider why it is that tests of general ability predict technical efficiency in training and job situations in Africa. Training situations depend largely on the ability of trainees to receive instructions and act upon them, as well as to discover relationships for themselves. Africans generally learn through a second language in a world of new tools, ideas and shapes. The exceptions may certainly exist, but the bulk learn almost from scratch with a background of few illustrated books, fewer jig-saw puzzles and almost no mechanical toys. Because one may be concerned to *develop* skills in a social and linguistic background where *aptitude* has had little nurture through relevant opportunity, language and materials, the verbal test seems to be a good one to begin screening with. Once a level of basic conceptual flexibility and mobility has been established, and the ability to understand instructions found to be present, then special screening devices may be applied. When a test combines these qualities from the beginning then it may be a matter of getting the proportion just right by controlled presentation in relation to a satisfactory criterion: but in naming the test one should be careful not to commit the 'jingle-jangle fallacy' (Bauernfeind, 1963, pp. 165-167) nor to ignore the warnings of early experiments . . . "we are not warranted in assuming interpretations for groups whose . . . culture and environmental background differ from those of our subjects" (Nissen *et. al.*, 1935, p. 310).

Lastly, the difficulties observed by Schwarz in attempting to predict academic success when school standards are not homogeneous, either at primary or secondary level must be considered in more detail. His treatment of the problem in general indicates how a testing philosophy may sometimes impose its own restrictions. While it is axiomatic, in prediction, to construct relatively uncorrelated measures that predict the criterion well, the very nature of the problem in African schools makes this almost an ideal solution which may seldom be attained in practice. Unless the effect of different school quality can be predicted there will undoubtedly result variance of a nature that will effectively censor individual differences and reduce prediction. From our experience, we could state that, at present, the biggest single cross-cultural influence on a child's learning in Africa is the school he attends. Because of this hypothesis, studies in academic prediction in central Africa have attempted, through consultation with inspectors, examination officers and by observation during visits to schools, to grade schools according to their ability to teach pupils well. As a consequence, it is possible to reproduce very closely primary school headmasters' estimates of examination success by using a normalised estimate of 'school quality' in conjunction with tests of English, Arithmetic and General Knowledge. Moreover, in follow-up studies in the secondary schools at one year's interval, the correlations between 'school quality' and Raven's *Progressive Matrices* and NIPR *Spiral Nines* in the selected groups are small, while these tests and 'school quality' correlate adequately with the criterion. Hence three influences are evident:

(a) the stimulus to learning provided by the total school environment, both at primary and secondary level;
(b) the measured general ability of the pupils within the heterogeneous school system; and
(c) the attainment skills of the pupils which are a product of (a) and (b).

Once these elements can be identified and predicted, and factorial studies just completed have achieved this, it becomes a matter of selecting appropriate variates from the factors to use in meaningful regression equations. At present, the major factors emerging are General Ability, English Language, Arithmetic, Social Awareness and Quality of School.* We have perhaps been fortunate in that the educational organisation permits effective grading of schools, but without this, 'censor variance' from an unpredictable source of learning and culture contact is a serious handicap to predictive studies.

One need not look upon a battery of global tests, attainment tests and estimates of school quality as a 'compromise' solution, however, as long as one does not assume that abilities are uncorrelated as a premise. If one takes as a 'standard' view that behaviour areas are or should be uncorrelated, then tests purporting to measure composites are naturally second best. This, though, is surely a matter of 'test philosophy' and the decision to maintain or abandon it must be made in the light of results. At present, in central Africa, there seems no good reason for not using tests that intercorrelate even quite highly, if their validities are high, while we are still exploring the precise contributions of various influences to the meanings of test scores.

In attempting a solution to the problem of 'censor variance', Schwarz suggests using the four basic arithmetic processes, assuming that they are all overlearned to the point of relative stability. Analyses in central Africa however, indicate that such skills, tested at the eighth year of education, correlate appreciably with 'school quality' and also with repeating this year of education. In fact, these skills are more susceptible to drilling, it seems, than others, and again the individual's score may be not as indicative of 'more general abilities in this field' as one might hope. The tables produced above also indicate caution in assuming that computational skills are necessarily uncorrelated, especially when all teaching in middle school standards tends to be done in a second language. If the test is speeded, however, then individual differences will result, but the scores then contain a source of variance that may, in Africa, where speed and time are not, culturally, universally understood or necessarily valued concepts, be something of a distortion. If the criterion demands speed, although few examinations of the traditional type which are commonly used as criteria do, then the strategy may be valuable.

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* A full report on these studies is being completed at present, and should be available soon.

This point brings us to ask whether or not speeded tests, in African educational measurement and selection are sources of variance of only marginal value, and whether it is worth while trying to control individual variance within a well-constructed test with a liberal time-limit. In fact, it may be necessary to let individual approaches to tests and the variance produced by these be part of the test score, within limits, when the precautions of ensuring that everyone understands what to do in and how to do a test have been observed.

In general, any test philosophy that seeks to level out what may be important sources of variance, such as differences of individual tactics and schooling may be denying itself valuable predictive elements. Other approaches, that can allow for such differences within their testing and experimental design place no onus on the test constructor or administrator to control or eliminate them, and make predictions less demanding in time and energy.

This discussion may have demonstrated that there is in the non-western field of testing, an acute awareness of the sources of variance in what may appear to be an 'ordinary' test situation. A hypothetical model for such sources of variance in African situations may be useful for further experiments, and one will be attempted as a conclusion. In this model, the break down supplied by Vernon (1962) is to some extent taken for granted, but there appear to be differences in the degree to which different types of variance may be important in African and western groups at present.

In the field of cognitive abilities one must assume little homogeneity of learning influences in schools throughout Africa. Secondly, there are considerable differences in the number and type of culture contacts with western ideas and values. These two influences are not uncorrelated but there can and does arise a situation where urban areas, rich in opportunity for culture-contact, have schools and students of poor quality because of overcrowding, malnutrition, lack of places to study outside school and so on. These contrast sharply with mission boarding schools in rural areas. Hence any test whose content contains matter affected by school attainment or by the need to include deliberately culture-loaded items for prediction purposes or whose logic may be said to be foreign to the structure of African languages, will reflect cultural variance that is extremely difficult to control, since even non-verbal items present their cultural problems. In Africa, differences in acculturation level are not small differences of degree, as they are in western societies, but because of their size and the polarity of western and African cultures, more akin to differences of kind: and this source of variance must be assumed to be far more severe in its effect than it might be in western societies.

The second source of variance is that attributable to the amount of learning or adaptation required to put the answers to the questions in the places required by the test format. The test will almost certainly ask a pupil to make a mark, draw a line or cross out, and such ways of making answers in a pattern demanded by the test are not easily comprehended by a child who has been taught to write words and figures in set-piece replies almost from the day he first held a pencil. Also, situations where the answer is actually printed and all one has to do is find it from a group of others are, as are tests without words, beyond the frontiers of everyday experience. Variance from this source must be termed test-situation adaptability and, as has been suggested, may never be wholly eliminated and indeed may be a useful element to raise or decrease according to the demands of the criterion, especially in non-verbal tests. Such variance is naturally of great importance, and testers must at least know how to control and use it if the test is to test what it sets out to test.

Also in the period of test preliminaries, it is usual to give some sort of idea of the items to be taken in the test. Practice items are not only allowed, but are actually demonstrated and explained. If these items or the underlying logical principles are foreign to the group — and one can be virtually certain that many will be — then additional variance will be present. It will consist in applying the principles recognised in the practice items to those encountered and recognised in the test itself, as might happen, for example, in tests of 'mechanical information.' In Ferguson's (1954, 1956) terminology we tacitly admit that the ability or skill about to be tested in this fashion has not already reached 'a state of crude invariance' but may be expected to reach such a state *at some indeterminate point in the test* when the test is a novel one. There is a distinct learning element involved in the final score, an element of immediate transfer (which may be positive or negative, unfortunately) of the cues, codes and keys of the practice items to those of the test itself, and within the time span of the test. If one wishes the learning element minimised, then extensive practice should be given until a universal learning plateau has been reached. If one wishes to maintain the learning element, then the programme becomes explanation with little practice.

Other sources of variance will, of course, include that which the test is supposed to measure, but which, as we have seen, may be affected by the above factors, variance unknown because of the infancy of African psychology, but which may include sets induced by stereotypes of the tester, if groups and tester are ethnically or socially different, or anxiety due to harsh motivation through fear of failure in highly competitive situations such as school examinations. Such variance is also closely associated with error variance, since it is, at present, unpredictable.

This hypothetical model may be expressed as follows—

$${}^{v}_{t} = {}^{v}_{t} + {}^{v}_{c} + {}^{v}_{a} + {}^{v}_{l} + {}^{v}_{x} + {}^{v}_{e}$$

Where ${}^{v}_{t}$ = total variance from test scores
${}^{v}_{t}$ = proportion of variance that may properly be assigned to test content, all other influences allowed for.
${}^{v}_{c}$ = variance in test content through the culture-contacts enjoyed in schools and in the environment.
${}^{v}_{a}$ = variance due to the format of the test, its instructors, its answer sheet (test situation adaptability).
${}^{v}_{l}$ = variance due to the immediate transfer of principles learned in practice administration items in novel test situations for any one test.
${}^{v}_{x}$ = any unknown source of variance.
${}^{v}_{e}$ = error variance.

The model is not linear, since there is bound to be covariance among certain of these sources; and it will be readily observed that the proportion of 'error' variance may be increased or decreased by any proportion of these sources of

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variance should it increase or decrease the tests' specificity or unreliability in relationship to a criterion.

It is ventured that this model, in conjunction with Vernon's table, holds good for sub-cultural groups inside and outside Africa, where any of these influences may be expected to contribute to total variance. An important step forward in psychometrics will be to apportion these sources of variance precisely, evaluate them in relation to criteria and then to screen out individuals for whom the whole test operation is invalid because unwanted variance has gone beyond a certain level of tolerance that may be experimentally determined. To sum up, it can be said that the relativity of test scores is nowhere more clearly defined than in Africa and that although predictions may successfully be made through regarding test scores as finite in meaning for *evaluative* purposes, their adequate *descriptive* meaning may throw more light on prediction problems (Irvine, 1963b). Meantime, one must observe caution in interpreting the meanings of test scores in western terms and watch carefully the labels given to tests constructed for use with unsophisticated groups. These cautions, of course, have more than local application.

To summarise, the main points are as follows:

1. The article by Schwarz shows a lack of historical perspective on testing in Africa, and this has been corrected.
2. Caution has been counselled in the naming of tests used in Africa until their interrelations with other types of tests have been fully explored.
3. Sources of test-score variance due to culture and learning contacts, test presentation, transfer from practice examples have been hypothesised and a model for these suggested.

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A Note on Communication in a Factory

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INTRODUCTION

OUR aim in this preliminary enquiry was to learn something about the communication system of a factory by examining certain measurable aspects of messages transmitted, by representative officials, through different channels. With this in view one of the fifteen Departmental Heads and one of the three Shift Engineers in his Department undertook to record the following details of the messages sent and received by them within a given period.

(i) Time spent in communication.
(ii) Time of day when message was transmitted.
(iii) Duration of message.
(iv) Person to whom message was sent.
(v) Who initiated the message, the D.H. (or S.E.) *or* another person.
(vi) Location: in the office of the D.H. (or S.E.) *or* in that of another person, *or* on the Shop Floor.
(vii) Whether the message constituted an interruption of another message.
(viii) Whether the attempt to make a face to face or telephone message failed.

From the information collected under these eight headings it is possible to present a provisional picture of the patterns of communication in the daily work of the two men. Records of the Departmental Head (D.H.), whose working hours remain constant from about 8.0 a.m. to 5.0 p.m., were studied over a period of 10 days; those of the Shift Engineer (S.E.) were studied for a period of 15 working days to cover each of the three shifts, night, morning and afternoon.

RESULTS

We shall refer briefly to the results of the analysis of the data under the eight headings. The tabulations are collected together in the Appendix.

(i) As may be seen from Table 1, both the D.H. and S.E. spend about 60 per cent of their time in one sort of communication or another. The D.H. devotes one-third of his total time to face to face communication; the S.E. devotes one-half of his time to this type of contact.

(ii) In Fig. 1 we show that the proportion of time devoted to communication varies from hour to hour. The S.E. peak times for transmitting or receiving information are at the beginning of each shift. There is an additional S.E. peak shortly after 8.0 a.m., when the D.H. and day staff commence work.

(iii) On the average the D.H. spends about three times as long as the S.E. in face to face contacts, the mean for the D.H. being about 4.5 minutes. The average duration of their telephone conversations is much the same, about one minute; about 80 per cent or more of these conversations last less than two minutes (see Table 2).

(iv) Now we come to the destination of the messages. Fig. 2 indicates the proportion of time spent, by D.H. and S.E., in communicating with recipients at different levels of seniority, inside and outside their Department. The bulk of the D.H's time is spent in communicating with those at shift engineer level, and he spends much time in communicating with those outside his own Department. The bulk of the S.E's time is devoted to communicating with foremen and shift engineers inside the Department.

FIG. 1: PROPORTION OF WORKING TIME SPENT IN COMMUNICATION OVER A 24-HOUR PERIOD [S.E.— D.H.---]

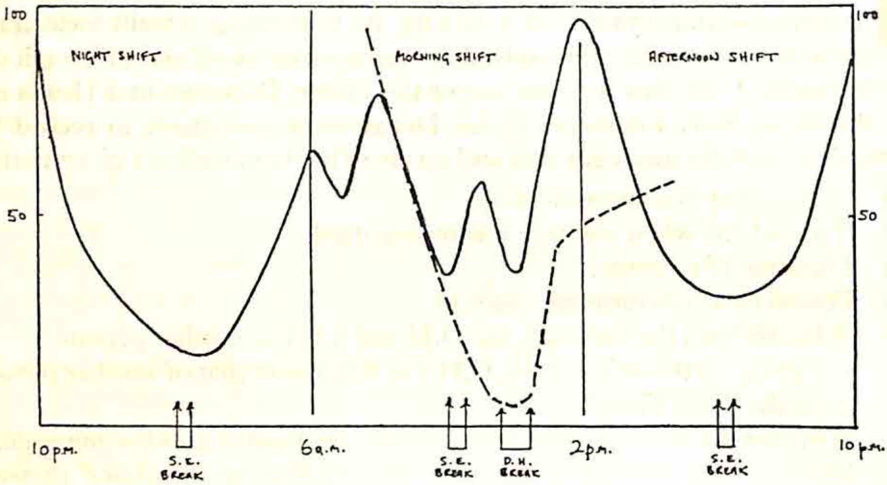


Fig. 3 shows the proportion of messages sent to or received from various groups of Departments: TII, other Production Department, Services, Management and Administration, and outside the plant.

Table 3 shows the total number of persons the D.H. and S.E. could, in theory, have contacted, at any given level of seniority, and the corresponding number they actually contacted in the period under review.

(v) Of all the 272 communications in which the D.H. was involved he himself initiated 30 per cent. Similarly the S.E. initiated 54 per cent of the 933 communications in which he was involved. These percentages may vary somewhat with respect to communications at different levels of seniority.

(vi) About half of the face to face communications by both D.H. and S.E. are made outside their own offices. A quarter of the D.H's and a third of the S.E's are made on the shop floor.

(vii) About a fifth of the communications of both D.H. and S.E. constitute an interruption of an existing communication. This means that about three-fifths of their communications are neither interrupted nor interrupt.

(viii) All the attempts made by the D.H. and S.E. to communicate, either face to face or by telephone, were successful, in the sense that they succeeded in making contact or in being contacted.

DISCUSSION

1. Clearly, both the D.H. and the S.E. spend a large proportion of their time in communicating, which must therefore be an important part of their work. Whether their communications are (a) economical in time and (b) effective in outcome, can only be known by an examination of their content. Thus, for example, if the content of face to face messages is much the same as the content of telephone messages it might be worth enquiring whether a reduction in the number of face to face contacts would be desirable in view of the fact that these last much longer, on the average, than telephone conversations. This question may be particularly relevant to the beginning of the D.H's working day, a time when his 'channel capacity' seems to be in danger of being overloaded. However there may well be communications which can be expeditiously made by telephone, and others which, for various reasons, require a face to face contact, which allows more feed-back, the presentation of documents, and generally a greater degree of freedom in the elaboration of points at issue.

2. The data available only permit a classification of messages between two parties. It may be that the life cycle of many communications involves four or five persons who form a communication net for this purpose. An analysis of the number and activity of these nets might prove instructive from the point of view of their effectiveness.

3. It is clear that neither the D.H. nor the S.E. restrict their communications to those at their own level or immediately above or below them. Such flexibility may have advantages over a more rigid, hierarchical system such as the Army or the Civil Service. In particular, the *proportion* of persons contacted at different levels of seniority poses a problem for further investigation. Why, for example were 7 out of 85 foremen contacted by the Departmental Head? Were there special reasons for singling them out? If so, do they justify a flexible system?

4. The relatively large number of interrupted communications suggests that an appreciable proportion of them may fall short of their objective. This appears to be one shortcoming of the system. There may well be others which would repay analysis. At least, a selected number of case histories of breakdown in communication might be examined.

5. We have only observed two members of the factory staff at a fairly senior level. A fuller study of communication would need to record and assess the messages sent from operators on the shop floor, their channels, their frequency, their goals, and their consequences so far as production and morale are concerned.

APPENDIX

TABLE 1: TIME (MINUTES) SPENT IN COMMUNICATING AND IN OTHER ACTIVITIES

Percentages

Channel		D.H.	S.E.
Face-to-Face ...		34	50
Telephone		6	3
Meetings		10	2
Writing		3	5
Reading		4	2
Other Activities ...		43	38
Total	Percentage ...	100	100
	Number ...	4760	7500

TABLE 2: DURATION (MINUTES) OF MESSAGES BY D.H. AND S.E.

Percentages

Minutes		D.H.		S.E.	
		Face to face	Telephone	Face to face	Telephone
	1	7	52	34	56
	2	13	28	22	30
	3	15	10	13	8
	4	11	4	5	3
	5	10	2	5	1
	5-10	17	4	11	2
	11-15	8	—	4	—
	10-20	10	—	2	—
	20+	9	—	4	—
Total	Percentage	100	100	100	100
	Number	168	104	185	148
Median		4.5	1	1.5	1

TABLE 3: ESTIMATED NUMBER OF PERSONS WITH WHOM CONTACT COULD HAVE BEEN MADE AT VARIOUS LEVELS OF SENIORITY

	Theoretical possible number	Actual number	
		D.H.	S.E.
Above D.H.	10	4	—
D.H.	15	11	5
S.E.	50	21	32
Foreman	85	7	27
Operator	800	9	55
Total	960	52	119

FIG.2 PROPORTION OF TIME SPENT IN COMMUNICATION
AT FIVE LEVELS OF SENIORITY

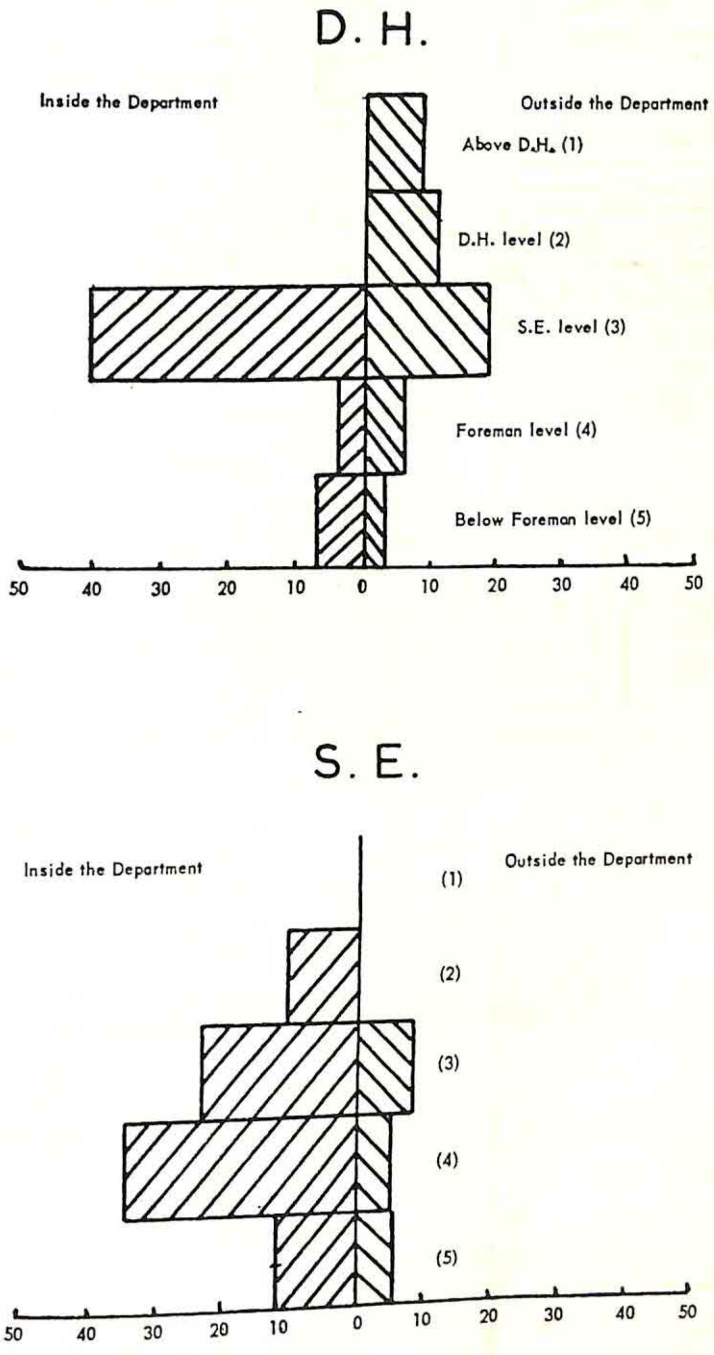
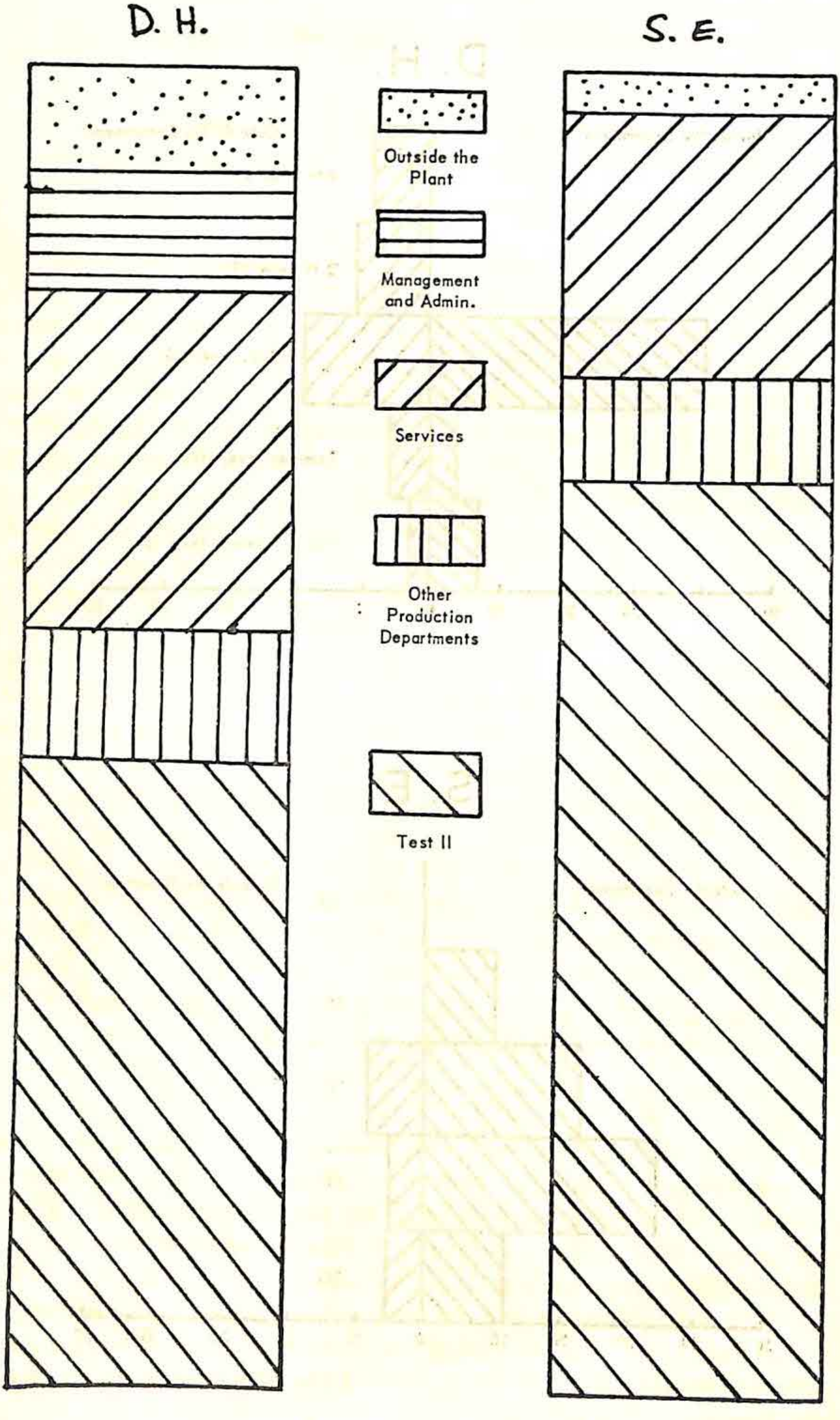


FIG.3 PROPORTION OF MESSAGES SENT AND RECEIVED FROM VARIOUS GROUPS OF DEPARTMENTS



Age and Absence: A Longitudinal Study in Three Firms

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THIS paper describes a longitudinal study of absence among long-service employees of three Merseyside firms. Most studies of the relationship between age and absence in industry are based on comparisons of the absence records of cross-sections of people in different age groups during a particular period, but "groups of people with the same birth-dates may have characteristics in common other than age, arising, for example, from their having grown up and started work in similar social and economic conditions" (de la Mare and Sergean, 1961). The essential weakness of the cross-sectional method is that it does not preclude the possibility of absence differences being due to these other factors. This weakness may be overcome by studying the absence history of one group of individuals over a long period. One study (de la Mare and Sergean, 1961) has in fact combined the cross-sectional and longitudinal methods and reports agreement between data obtained from the two methods showing that length of certified sickness absence was higher for older workers. But the investigators also observe that "in the case of frequency of absence, however, the suggestion of the cross-sectional method that high absence frequency is a characteristic of younger people is not supported by the longitudinal evidence."

Although this finding relates to Other Reasons Absence only, it is interesting to note that it differs from the results of many cross-sectional studies which indicate that younger workers have most frequent absences (of all types) than older workers. The availability of absence records for a group of long-service employees over a period as long as 35 years (see Firm A below) thus afforded an unusual opportunity of furthering study of this problem.

Firm A

Firm A, employing 1,775 workers, manufactures soap powders and chemicals. The firm's personnel records go back to 1929 and a sample was taken of all 'shop-floor' employees who had been with the firm since that year. This gave a total of 89 men. The group was homogeneous in terms of age (Mean: 54.44 years, S.D.: 4.29 years) and length of service (Mean: 38.58 years, S.D.: 2.41 years). The firm recorded absences in the following ways: (a) Certified Sickness Absence, (b) Permitted Absence and (c) Absence for which no reason was given. The means for both frequency and length of the absences in these three categories are shown in Table 1 below.

TABLE 1:

MEANS OF FREQUENCIES AND LENGTHS OF ABSENCES OF VARIOUS KINDS FOR LONG-SERVICE EMPLOYEES OF FIRM A*

		PERIOD												
		1929-1930	1931-1932	1933-1934	1935-1936	1937-1938	1947-1948	1949-1950	1951-1952	1953-1954	1955-1956	1957-1958	1959-1960	1961-1962
Percentage FREQUENCY per man	Certified Sickness Absence	.13	.15	.18	.19	.25	.25	.26	.26	.24	.28	.26	.33	.36
	Permitted Absence	.01	.03	.04	.05	.08	.20	.19	.17	.18	.21	.24	.26	.32
	Other Reasons Absence	.02	.03	.01	.03	.04	.05	.06	.04	.02	.04	.04	.01	.01
Percentage LENGTH (in days) per man	Certified Sickness Absence	1.59	1.63	1.61	1.91	2.73	2.52	2.97	2.80	2.66	2.76	2.63	3.81	4.01
	Permitted Absence	.01	.05	.06	.09	.09	.24	.19	.17	.22	.22	.25	.22	.26
	Other Reasons Absence	.05	.03	.02	.03	.04	.04	.05	.04	.01	.04	.03	.01	.00

*Because of a reduction in the length of the working week from 6 days to 5 days in 1936, it was necessary to express the data in percentage terms by using the following formula:

$$\frac{\text{No. of Absences (Frequency) or No. of Days Absent (Length)}}{\text{No. of days scheduled to be worked in any 2-year period}} \times 100$$

Table I shows that there are systematic increases over time in both frequency and length of Certified Sickness Absence and Permitted Absence. This finding is clearly opposed to the results of the cross-sectional studies referred to earlier. It is also worth noting that the increase in Permitted Absence may be similar to the increase in Other Reasons Absence data of de la Mare and Sergean, since this category of absence included 'absence with reasonable excuse' i.e., Permitted Absence. In view of the possibility of our data being idiosyncratic to Firm A itself, it was decided to extend the study to two other firms.

Firm B

Firm B is a member firm of the same large international company as Firm A. Although largely autonomous, it has similar personnel policies to those of Firm A, thus giving the study some degree of methodological control with regard to the employment practices of the two firms. The firm is concerned with processing oils and fats for domestic use and employs a little more than 1,500 people. A two-thirds sample of all male employees with over 25 years' service at the time of the study was selected, giving a total N of 147. Unfortunately, the firm's personnel records did not go back beyond 1948, so that the period covered in this part of the study (1948-1963) is less than half of that covered in the case of Firm A. However, the sample was similar to that of Firm A in terms of age (Mean: 52.58 years, S.D.: 7.11 years) and length of service (Mean: 31.88 years, S.D.: 6.79 years) although having larger dispersions on these two variables.

Absences were recorded by the firms as follows:

(a) Certified Sickness Absence, (b) Permitted Absence, and (c) Absence for other Reasons. As so very few instances of Other Reasons Absences were recorded, this cateogry was not included in the analysis. The means for frequency and length of Certified Sickness and Permitted Absences are shown below in Table 2.

TABLE 2:

MEANS OF FREQUENCIES AND LENGTHS OF ABSENCES OF VARIOUS KINDS FOR LONG-SERVICE EMPLOYEES OF FIRM B

		PERIOD							
		1948-1949	1950-1951	1952-1953	1954-1955	1956-1957	1958-1959	1960-1961	1962-1963
FREQUENCY per man	Certified Sickness Absence	3.17	2.81	2.22	1.87	2.19	1.90	1.76	1.99
	Permitted Absence	0.85	0.68	0.81	0.52	0.89	0.66	0.69	0.84
LENGTH (in days) per man	Certified Sickness Absence	20.26	19.44	15.35	15.44	17.88	14.96	18.33	21.21
	Permitted Absence	1.23	1.06	1.30	0.83	1.54	1.13	0.94	1.19

With the exception of the increase in the length of Certified Sickness Absence, the data in the table are perhaps only noteworthy because they do not suggest any trend differences. However, the fact that there is at least no decrease in frequency of absences is worth pointing out, differing as it does from the results of previously noted studies (e.g., Heron and Chown, 1961; Liddell, 1954).

Firm C

This firm manufactures animal foodstuffs, soaps and edible fats. It has 2,520 employees. A one-third sample (N=156) was taken of all employees who had commenced work with the firm before 1930. Absence records were available from 1946 to 1961. The mean age of the sample was 58.06 years (S.D.: 4.80 years) and the mean length of service, 38.97 years (S.D.: 6.54 years). Absences were recorded in the same categories as were used in Firm B. The means of absences in these categories are shown in Table 3.

TABLE 3:

MEANS OF FREQUENCIES AND LENGTHS OF ABSENCE OF VARIOUS KINDS FOR LONG-SERVICE EMPLOYEES OF FIRM C

		PERIOD							
		1946-1947	1948-1949	1950-1951	1952-1953	1954-1955	1956-1957	1958-1959	1960-1961
FREQUENCY per man	Certified Sickness Absence	1.62	1.60	1.67	1.72	1.81	2.34	2.09	2.30
	Permitted Absence	1.39	1.39	1.38	1.26	1.95	1.49	1.40	1.26
	No Reason Absence	0.63	0.31	0.26	0.32	0.14	0.38	0.28	0.20
LENGTH (in days) per man	Certified Sickness Absence	21.19	24.19	22.99	24.87	23.42	30.79	30.74	30.14
	Permitted Absence	1.79	1.90	1.71	1.82	2.51	1.92	1.71	1.60
	No Reason Absence	0.67	0.31	0.31	0.33	0.18	0.46	0.29	0.24

The table shows that, as expected, length of Certified Sickness absence increases with age. A finding of more interest is that the frequency of Certified Sickness Absence also increases with age. This increase is of course similar to that found in Firm A.

Discussion

The most striking feature of the foregoing data is that in none of the three samples studied is there an indication that frequency of absence decreases with age; in fact, in two of the samples there are emphatic increases in absence frequency with age. Such results naturally lead one to question the general significance of findings from cross-sectional studies, but it is equally important to ask the same question of longitudinally-based results. With regard to the data presented here, it is still not possible to assert that the observed increases in absences result from age increases—they may equally be due to external factors of economic and social change such as have been responsible for the general adoption of more 'employee-centred' policies in industry. In addition, discrepancies between the results of studies using the different methods (or indeed between results based on the same method) may reflect the *greater* influence of other variables, (e.g., type of work, size and structure of firm) over that of age rather than indicating that age has no appreciable influence on employee absence in these situations. For example, it is interesting to speculate on the relevance to the present findings of a study of clerical employees by Jackson (quoted by Cartwright and Zander, 1960) who found that the more competent workers had the higher absence rates: "Perhaps the more competent workers were so secure concerning their relations with the company that they could freely stay away from work whenever it seemed necessary" (Cartwright and Zander, p. 72). It is not inconceivable that some similar process affected the absence behaviour of the present study's rather special samples of long-term employees: perhaps the longer they remained with their firms, the more secure they felt.

The fact that Firm B's data differ so much from those of Firms A and C may well reflect ecological differences. The latter firms are situated in densely populated areas with long industrial histories; Firm B on the other hand, lies outside of the industrial area proper and draws its employees from a correspondingly different segment of the conurbation.

Although these are no more than personal observations, the present writers believe that ecological variables may determine norms of employee behaviour, thus contributing to an organization's unique 'culture' in the sense defined by Jaques (1951 p. 251). Further advances in the study of the age-absence relationship are undoubtedly attendant upon the recognition and control of such other contaminating factors, difficult though this will be.

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Capacity and Inclination for University Courses*

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CAPACITY AND INCLINATION MUST BE DISTINGUISHED

OUR success in any enterprise may be said to depend basically on three things — our capacity, our inclination, our opportunity. I shall use these terms to cover broadly what we are capable of doing, what we want (or are at least willing) to do, and what we have a chance to do.

My task is to deal briefly with the first two, capacity and inclination, and I begin by suggesting that the importance of the second is commonly under-rated. Indeed, much current discussion on the suitability of people for university courses seems to assume that all we need consider seriously is capacity. So we have an undue focussing of attention on the study of what are usually called nowadays 'reserves of ability', their nature and measurement. To those unfamiliar with work in this field I strongly commend a book entitled *Ability and Educational Opportunity*. Edited by Dr A. H. Halsey, it is a report on a conference held in Sweden in 1961, under the auspices of the Organisation for Economic Co-operation and Development and the chairmanship of Mr H. L. Elvin, the Director of the University of London Institute of Education.

However, the deficiencies of this rather one-sided approach are very clearly seen when we cast an eye over manpower planning problems of other kinds. I am myself engaged on a manpower survey in Fiji, where my task is one of estimating what the Colony's requirements for high-level and middle-level manpower will be in 1970, in both the public and the private sectors of the economy; and to consider their educational implications. In my view, anyone who ignored the distinction between capacity and inclination in tackling this assignment would be wasting his time. There are two major groups in the population — the Fijians and the Indians. There is no evidence that I have found to support an assertion that either group is superior to the other in educational capacity; but it is quite plain that the Indian thirst for education far outstrips that of the Fijians. As the Burns (1960) report has it: "There can be no doubt that the easy-going nature of the Fijians, and the effects of their culture, have been a handicap to them in competition with other (immigrant) races."

But we need not go to developing countries for clear indications of the importance of looking at capacity and inclination separately. The distinction between what people are capable of doing and what they want to do has appeared in many verbal guises down the centuries, from the 'talents and temperaments' of the ancients to the 'skills and attitudes' of contemporary writers. Moreover, we know now that the distinction is soundly enough based. Nevertheless — partly, perhaps, because of methodological difficulties of the sort hinted at by Lord

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* A contribution to a symposium on Universities and the Social Fabric held by the British Association for the Advancement of Science at its Southampton Meeting in 1964. Professor Rodger added later the footnote which appears on page 40.

Brain in his presidential address to the Association last week — we seem unwilling to face it. It would apparently stiffen our task beyond endurance.

Certainly, we often fail in practice to appreciate that an individual may display a good deal of competence in a field of study which holds little real interest for him, or which has lost the interest it had. Not long ago I was asked to give careers advice to a young man who had taken a first in psychology. He stipulated that I should not try to persuade him to continue in it. "I feel I've done psychology," he said. Similarly, we frequently ignore the possibility that, however eagerly he may try, there may be some things a student will never do well. It is curious that we seem readier to accept the facts about this paradox when we consider our hobbies than we are when we reflect on what we call our 'work'. We may find amusement in our own bungling but enjoyable attempts to play golf or the guitar and freely — even proudly — acknowledge our incompetence. We are less prepared to own up to lack of expertise in jobs we have taken on, or to lack of progress in courses of study which have attracted us.

Here, then, lies a danger, the first of several I shall mention. However awkward it may be for us to recognise that capacity and inclination do not always go together, we must do so. To shut our eyes to the fact is to risk both social waste and individual misery. They must be looked at separately.

SO MUST ATTAINMENT AND INTELLIGENCE

A second danger is that in our study of capacity for university work we may, for similar reasons, continue to lay too much stress on the evidence provided by present attainments, and particularly by present academic attainments. There is, of course, a good deal of evidence of reasonably close links between GCE results and the results of degree examinations. Furneaux (1961), for example, in his Nuffield enquiry, produced figures which showed that GCE results gave better predictions of university examination results than any other predictors used in his investigation. But the evidence scarcely warrants the emphasis usually placed on A-level performance, unless we make the assumption that what we are after is simply rough justice, administered cheaply. (There are, I need hardly say, other assumptions involved, including the assumption that our university courses and examinations are in a satisfactory state).

As the place of both attaintment and intelligence in the estimation of capacity has had much attention in recent years, I shall make only two points about it. The first is that it is a pity that discussion of topics of the nature-nurture kind have once more become befogged by political considerations. With the environment emphasisers mostly on the left, and the inheritance emphasisers mostly on the right, but neither team letting on, it is sometimes hard to evaluate a piece of research. I am not suggesting deliberate partisanship, because we all know now that we can have biasses without knowing about them; but I do not suppose I am the only reader of books and papers on the subject who feels bound to wonder, sometimes, whose side the author is on.

The other point I want to make about the intelligence-attainment problem is that we should not forget about the valuable material presented in the Crowther (1959) report, in the sections dealing with data from the National Service

Survey for England and Wales. In the OECD report I have mentioned, the Swedish psychologist, Husen, puts forward further calculations based on the same data. These suggest that there was enough 'talent' in the group of six thousand British soldiers to have raised the percentage with two A-levels from 9 to 16. The steady annual rise in A-levels since then, even when allowance has been made for 'the Bulge', has lent strong support to the conclusions Husen drew. Similar results were obtained in investigations carried out in Sweden itself, by Harnqvist; and in Holland by the Central Planning Bureau of the Netherlands. These, too, are dealt with in the OECD report.

I have suggested that there is a danger of our attending too much to capacity and too little to inclination, relatively; and a further danger that in attending to capacity we may put too much stress on attainment and too little on intelligence. There is a third danger. It is that we should not appreciate properly some of the pointers given us by recent work on the relationship between capacity and social class.

THE IMPORTANCE OF HAVING A PROFESSIONAL OR MANAGERIAL FATHER

If comment on this seems to be outwith my terms of reference, let me say that I am not here concerned with social class as a primary determinant of opportunity in the ordinary sense, but as a precipitator of psychological problems. I am thinking of social class as a factor in the facilitation or hindrance of the inclination to study. Particularly important, in my view, is the task of assessing fairly the boy or girl whose capacity and inclination for university work has not merely lain undeveloped but has in a sense become atrophied, through unfavourable home circumstances. Vernon (1960) has ably summarised and discussed evidence which leads inescapably to the conclusion that capacity is influenced by environmental factors of many kinds. We know very well, as Robbins (1963) points out, that inclination is similarly influenced. May this not all mean, in practice, that the information we already have on the relationships between attainment, intelligence and social class is likely to produce *under*-estimates of our reserves?

Let me add that Husen (1961), again using data from the British National Service group of six thousand, produces a table showing the connections between A-level results, army selection test scores and father's occupation (divided into professional and managerial *versus* the rest). Of those in ability group 1 with professional or managerial fathers, 68 per cent had at least two A-levels. Of those in ability group 1 with fathers in other occupations, only 44 per cent had at least two A-levels. For further enlightenment on this topic, we have only to turn once more to the Robbins report, to the section labelled, rather pointedly, 'the so-called pool of ability'.

THREE CHEERS FOR THE UGC, BUT NONE FOR PSYCHOLOGISTS?

There is a fourth danger. It is that through our local addiction to specialisation we may make it impossible for ourselves to investigate systematically the limits of educational and occupational versatility. (I say 'local' rather than British, because I must exclude my fellow-Scots from the implied criticism.)

I submit that in these days of rapid and extensive technological change, and consequential occupational change, versatility of both capacity and inclination deserves far more study than it receives. How are we going to know who can be switched to what when an urgent need for switching arises? At all levels of work, and in all types of work, there is a growing need for more facts, about what we shall soon, I suppose, be calling 're-trainability'. Galton, you may remember, spoke of 'the versatility of genius'. Perhaps even before his day there was awareness of the fact that some people can turn their hands — or their heads — to anything and make a success of it. But have we any idea how numerous they are? No. Do we give ourselves the chance to find out? No.

I submit, further, that some of the chief forces of reaction are to be found in our own academic ranks, among those who uphold specialisation in circumstances in which its appropriateness is, to say the least, questionable. We put the specialist out on a limb and then pretend it is a pinnacle. There is something very odd happening in our midst, surely, when we in academic psychology complacently operate a scheme which applies to our first degree students conditions we warn them to avoid like the plague when they are designing experiments.*

Fortunately, the University Grants Committee has for some years been fostering the notion of the joint honours degree. Is it too much to hope that these will become common? In this way we could cut down our present ignorance a little; and at the same time we could give our students a chance to find out methodically what they are best at and enjoy most. I have spoken on other occasions (Rodger, 1961) about what I call 'planned procrastination', and I shall not go into it again here. However, I make bold to suggest that systematic studies of planned procrastination in the choice of school and university courses are much more likely to advance our knowledge of capacities and inclinations — their nature, their development, their pathology, their measurement — than any amount of early specialisation.

THE SPECIAL FUNCTIONS OF BIRKBECK, AND THE NEED FOR MORE BIRKBECKS

This leads me to the fifth and last of the main dangers that beset us. It is that, in our concern for the younger age-groups, we may neglect the special problems of the mature university student. At Birkbeck College, in the University of London, we have sixteen hundred students with an average age of nearly thirty. A recent survey (Cavanagh and others, 1964) in which three-quarters of the students replied to questions on who they were, where they came from, and why they came, produced information which deserves consideration outside Birkbeck; for it has, I think, a 'message' for educational planners. There is no reason to suppose that the non-responders differed in material ways from those who did reply, and it seems justifiable to draw several general conclusions from the returns.

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* On reflection, I think this is an understatement. Psychologists should be the first — literally the first — to argue the case for well-designed investigations, experimental and non-experimental, that would shed much-needed light on the conditions in which specialist courses should be preferred to more general courses. Yet there is a clear tendency in psychology, as in other fields, for academics to assume that the 'best' students should be accepted for one-subject honours degrees wherever this can be done. It seems, moreover, that among those most inclined to neglect the need for experimentation in this important matter are some who never tire of reminding us that they are 'experimental' psychologists.

It seems that half the students who registered or re-registered at Birkbeck last October for internal degrees of the University of London already had degrees from a recognised university. Of this half, two-thirds were aiming at a higher degree — an M.A. or M.Sc. or Ph.D. The other third of these graduates were aiming at taking a second 'first' degree — a B.A. or B.Sc. The remaining half of all the registrants were 'beginners', going for a B.A. or B.Sc.

How do they come to be there? Taking the last group first, we can say that many of the beginners are men and women who, for one reason or another, missed the boat at an earlier stage. Some, no doubt, can be regarded as people who had not previously had much of a chance. Some are people who, at the time of making a decision, felt no inclination towards university studies or were in the event pulled more strongly in another direction. Some, of course, are women who had married early and had later, for family reasons, to think about preparation for a career. Birkbeck has had, in its time, some illustrious 'late starters', and I have no doubt that it will have many more, for it is inconceivable that all these sources of supply will dry up, however much is done for the young.

But, important though these beginners are, in the sense that they demonstrate the usefulness of a kind of 'long-stop' institution, it seems that the others are no less important. What it amounts to is that many of the students for higher degrees are men and women anxious to make progress in their chosen line. They have already settled what it should be. They have in many cases married and are raising families. They could not afford to become full-time students again, for even if grants were more readily available to them than they are (or seem likely to become), to take one would involve considerable immediate sacrifice and perhaps considerable long-term risk. They have jobs in or near London. What could be more appropriate than to register for a part-time higher degree course, particularly if they want further instruction of the 'advanced course' kind? The survey confirms incidentally what was known roughly before, that many Birkbeck students are people who have sought jobs in London in order to do this. Two of our departments — Professor Bernal's department of crystallography and my own — are entirely postgraduate. To a great extent we are catering for the kind of mature student whose needs were discussed by Sir Eric Ashby in his presidential address to the Association last year.

However, the Birkbeck student who is already a graduate may have another object in mind. He may want to take up a new discipline from scratch. Sometimes this happens because he has found that his first choice was mistaken. Sometimes there is another reason. A man may embark on a degree course in another subject because he has become interested in problems lying on the frontier between it and his first subject. During the last few days several periodicals have reviewed a book called *The Qualifying Associations*. Its author is Geoffrey Millerson. Having taken a first degree in sociology and a Ph.D. in sociology at the London School of Economics, where he is a senior research officer, Dr Millerson is now a part-time student at Birkbeck, taking another first degree, this time in psychology, with my colleague Professor Summerfield. He has been led to this in the very way I have indicated, and I have no doubt that his enterprise will prove to be of benefit to both disciplines. Could there be a better way of encouraging cross-fertilisation?

In short, studies of reserves of capacity and inclination for university courses should not restrict themselves to the young. There is potential among the mature, including men and women who have already graduated but cannot become full-time students again. Advanced courses will continue to be required, perhaps increasingly. Changes of discipline will often seem desirable, for individuals and for the community. Also, there may be research which can be *better* pursued by older, experienced, part-time students, well dug into their employing organisations, than by others.

It is worth noting that among the 86 per cent of Birkbeck students registered for honours degrees or higher degrees, the psychologists constitute the largest group. About one in five are working for degrees in psychology, including occupational psychology. There is perhaps a hint here that places of the Birkbeck kind may be particularly useful in providing courses in subjects which are not 'school' subjects; for example, psychology, sociology, statistics. The big general classes in the public services could almost certainly profit — especially in preparing men and women for duties which are in fact more specialised — from having facilities of this kind more readily available. Perhaps we need a Birkbeck in every highly-populated area.

EXPERIMENTS OR SURVEYS? OR BOTH?

My last point is this. In our enquiries into capacity and inclination for university courses, we are inevitably hindered by lack of freedom to experiment in a rigorous way. I have suggested elsewhere (Rodger, 1949) that *three* criteria must commonly be met in research in the so-called social sciences. It must be technically sound, administratively convenient, politically defensible. Very often this means that experimentation is ruled out. Especially when we are dealing with matters which may have some bearing on major issues arising in the fields of education, health, employment, defence and crime, there may be important political restrictions on our choice of procedure. Indeed, a proposal for almost any kind of controlled experiment, except the most trivial, is likely to stimulate protest. People must not be used as guinea-pigs, we are told. Citizens must not be deprived of their right to be treated the way they have always been treated. An alternative argument, where the political one seems thin, is that an experiment would be costly or awkward to arrange or both. Of course, there are organisations in which experiments with people can be done. A medical umbrella can be very useful, and so can a military uniform. But for most of us these protective coverings are not normally available.

This means that we must make considerable use of survey techniques, and of appropriate methods of statistical analysis. Occasional cross-sectional studies appear to be as much as we can hope for, usually. But these could, surely, be more often supplemented by developmental studies. It is unfortunate that this symposium has come too early for us to take account of relevant work being done by Dr James Douglas's team in their National Survey of Health and Development. In this, as some of you will know, we have a group of young people who have been studied systematically since they were born in the first week of March, 1946. Indeed, the enquiry started before they were born. Next month about 300 of the three and a half thousand will embark on university courses, for the whole lot will then be eighteen and a half. Last year only 20 did so. There seems a fair chance of our learning more about capacity and inclination for university courses. But not yet. All that can be reported at this stage is that, at the last time of asking, the mothers were more ambitious academically for their boys and girls than were the young people themselves; they were more ambitious for their boys than for their girls; and they were more ambitious for them both if they were middle class than if they were working class, but not by a substantial margin.

TO SUM UP

Work already done on capacity and inclination for university courses suggests that our reserves, and those of other countries, are great. In studying them, and in seeking to use them, we must be alive to several dangers. We must be ready to look at capacity and inclination separately. We must be careful not to judge capacity too much by present attainment. We must take account of the effect of unfavourable circumstances on the inclination to study. We must beware of early specialisation. We must not neglect the potential of mature people, non-graduate and graduate. And, because experimentation in this field presents not only technical difficulties, but also political and administrative problems, we must be prepared to use survey methods extensively. But the possibility of doing this will not release us from our scientific obligation to search for, and where we can create, conditions of investigation which will more surely lead us to real advances in our knowledge.

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The Assessment of Instructors

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INTRODUCTION

THE investigation described below was carried out in 1954, when the author was a member of the staff of the Personnel Department, General Post Office. Though anonymity was ensured at the time, the lapse of nearly ten years has served to make even more certain that the individuals who took part in it, assessors as well as assessed, could not be recognised. The fact that the results were submitted as evidence to be considered by a joint official and staff study group indicates a need for caution in publishing work of this sort. The organisational background in 1954, when the writer was engaged in training work in the GPO, differed from present arrangements in some respects.

Full-time instructing staff in GPO non-engineering regional training schools were selected after advertisement within the Department; in general they served a 3-5 year period at the school before returning to normal duties. Selection was a regional responsibility, and the Regional Training Officer (who had an oversight of teaching methods and of the quality of teaching in his Region) took part in it. Successful candidates attended teaching methods courses at GPO Headquarters, augmented by personal coaching and guidance from the Regional Training Officer and the officer-in-charge of the school concerned. Since selection for instructing duties often meant temporary promotion, there was normally no dearth of candidates.

PURPOSES OF THE INVESTIGATION

There were two main purposes. In the first place, it would be a matter of some surprise if Regional Training Officers (or Head Teachers, School Inspectors or other people concerned with teaching ability) were unanimous in their answers to the apparently simple question: What makes a good instructor? Some give most weight to specific personal qualities; others to job experience and job knowledge. The main purpose, then, was to try to identify the qualities and behaviour characteristics exhibited by the instructor judged by the Regional Training Officer to be the best in his group, at the same time sharpening them by contrast with those of his weakest colleague. If a pen-picture of the 'good instructor' could be drawn, this would be valuable to local controlling officers and managers who acted as 'first sieve' in the selection process, by recommending the regional selection board to see or not to see the candidates who applied to them for consideration. The second purpose of the investigation was to try to find a suitable yardstick—a finer instrument than a pen-picture—by which would-be instructors could be assessed at regional level, and successful candidates judged at various stages in their period of service. Various forms of assessment were already in use, but they were subjectively designed; it seemed clear that only an instrument securely based on evidence of the performance of existing instructors could serve a really useful purpose.

BASIS OF ASSESSMENT FORM

The NIIP Seven-Point Plan (Rodger, 1951) for selection and vocational guidance was used as the basis of the investigation. Those Regional Training Officers who did not have at least a nodding acquaintance with it were readily convinced of its potential. All the attributes and items of behaviour which, *prima facie*, might have some direct influence on teaching ability were listed under the seven main headings, the polar extremes of each set out as X and Y and four columns provided to rate the individual. The choices were A (X applies), B (Tendency to X), C (Tendency to Y) and D (Y applies). No 'average' column was provided because of the well-known tendency of assessors to seek refuge in it; but a 'general remarks' space offered opportunity to amplify markings and write a brief pen-picture. The assessment form is reproduced in Form 1 (the 'general remarks' space and other items—name of assessor, etc. — have been omitted because of difficulties in reproducing the form as a whole in this Journal).

Copies were sent to the Regional Training Officers with the request that they should assess their 'best' and their 'weakest' instructor in each of the types of school in their Regions (Clerical, Telephone, Telegraph, Postal and Counter). They were asked not to mention any names and to return the forms for analysis. Eight Regional Training Officers co-operated with this stage, the purpose of which was to find out which items discriminated most clearly between the 'best' and the 'weakest' instructors.

It will be apparent that this investigation was designed to be carried out by non-psychologists, and in the knowledge that its results might well challenge old predilections and opinions, and encourage them towards different attitudes in their future work of selecting instructors. It was therefore essential to conceive it in such a way that its purpose and design could not be misunderstood, and to assemble and present the results in such a manner that sophisticated statistical techniques could be avoided. Finer techniques of design and analysis could have been used, but probably only at the expense of much-valued co-operation and mutual understanding. The analysis and interpretation of the results set out below are, apart from minor editorial changes, precisely as they were presented to Regional Training Officers in various conference papers. This form has been used in the present report because it may be of interest in itself.

ANALYSIS OF DATA

Inferences from inspection

Since not all Regions employed instructors in each of the five fields which have been mentioned, markings were summarised for all the 'best' and all the 'weakest' irrespective of field of activity. In any event numbers for each type would have been too small for any kind of statistical analysis. Neither was any attempt made to differentiate the sexes. Thus, totals for each rating (A, B, C and D) for each item were obtained. For example:

Item 6.2—Influence on Others: Leadership

	A	B	C	D	Total
'Best' instructors	11	14	3	—	28
'Weakest' instructors	—	2	11	7	20

Item 4.1—Mechanical Aptitude

	A	B	C	D	Total
'Best' instructors	3	8	14	2	27
'Weakest' instructors	1	8	11	1	21

It will be seen that in the first example the 'best' instructors are bunched at the A/B end of the scale and the 'weakest' instructors at the C/D end. Item 6.2 therefore seems to discriminate well between 'best' and 'weakest'. On the other hand there is little bunching in the second example and certainly no distinction between 'best' and 'weakest'. 'Mechanical Aptitude' appears therefore to have no discriminative value; from inspection alone we would not be inclined to say that because a man has a 'mechanical aptitude', it is likely that, other things being equal, he will be a good or poor instructor in these particular fields. But we would be inclined to say with a fair degree of certainty that the man who strongly influences other people will be a better instructor than the man who has little influence on others.

Statistical analysis

The above examples show how apparently valid estimates of the usefulness of the items in the experimental form can be made by inspection; but it was clearly necessary to go beyond this and to employ some simple statistics. The method was basically simple addition, 'weighting' of A, B, C and D ratings and calculation of 'discrimination ratios'. No tests of significance were used.

The first step was to convert the 'raw' scores of the 'best' and the 'weakest' for each item into a percentage score, because not every instructor was rated on every item (see totals in the two examples). Thus, the totals for item 6.2 — *influence on others* — can be expressed as follows:

	A	B	C	D	Total
'Best' instructors	39%	50%	11%	—	100%
'Weakest' instructors	—	10%	55%	35%	100%

The next step was to weight each column (A, B, C and D). This weighting can be quite arbitrary, since 'best' and 'weakest' are treated equally. The simplest weighting is A = 4, B = 3, C = 2, D = 1. Thus, once again using item 6.2 as an example, the following figures are obtained:

	A	B	C	D	Total
'Best' instructors	39×4 (156)	50×3 (150)	11×2 (22)	— —	328
'Weakest' instructors	— —	10×3 (30)	55×2 (110)	35×1 (35)	175

It will be seen that the theoretical maximum for each item is 400 (100% in A column) and the theoretical minimum is 100 (100% in D column).

INTERPRETATION OF RESULTS

Rank order of items for all instructors

These weighted totals may now be used for several purposes. The first is to find out how different items compare in importance for *all* instructors. This is achieved simply by adding the two weighted totals ('best' and 'weakest') and arranging the items in rank order of grand total. This has been done in Table 1, which will be seen to have some practical value. Heading the list, we have what may be termed 'recruitment' or 'application' qualities. For example, a man would be unlikely to apply for an instructing post unless his *health* were above a certain minimum standard (in fact, he would not be recruited into the GPO at all). Similarly, an applicant would probably be comparatively *free from serious domestic worry*, and he would be ambitious enough to have applied in the first place (probably attracted by the *pay incentive*).

The list then shades into those items which are either matters of fact or which can with fair confidence and accuracy be assessed by an appraising officer—*appearance, physique, bearing*—down to (say) *voice*. Then come the items which are either comparatively difficult to assess and/or are not considered necessary to assess. It is notable that *influence on others* — an item which is uncomfortably difficult to measure - comes way down the list.

Rank order of items for 'Best' and 'Weakest' instructors

Tables 2 and 3 give an indication of the relative importance of each item for the 'best' and 'weakest' instructors separately. Comparison of them provides the first clues to what amounts to a 'profile' or 'pen picture' of the ideal instructor. This comparison can be made by halving the two lists arbitrarily after the 15th rank order, (i.e. into high and low scoring items) and listing (A) those items which yield high scores for both 'best' and 'weakest' and (B) those items which yield high scores for the 'best' only. The lists are as follows:

A. *Common*

Health — ambitiousness — appearance — dependability — freedom from domestic worry — bearing — physique.

B. *'Best' only*

Benefit from experience — voice — occupational training — knowledge of work — breadth of occupational experience — use of intelligence — acceptability — popularity — self-reliance — confidence.

It will be seen that list A, with the single exception of 'dependability', is composed of the items mentioned earlier as 'recruitment' or 'application' and 'easily assessed' items. Even the exception is no real surprise, since an erratic person would hardly be recommended by his immediate superior for interview. Quite apart from this, it would be asking too much for a study of this kind, based as it was upon the judgment of eight different people and upon comparatively small numbers, to supply a completely clear-cut result.

Discriminative value of items

The foregoing comparison has yielded a list of items or 'qualities' which seem to differentiate effectively between good and weak instructors. As a final and finer check, however, a numerical 'discriminative value' has been worked out for each item simply by dividing the total score of the 'best' instructors by the total score of the 'weakest' instructors. These values are placed in rank order in Table 4. The need for such a check will be apparent when it is appreciated that an item might be designated 'low scoring' for both 'best' and 'weakest' instructors (Tables 2 and 3), and, therefore, would not appear in the earlier 'pen picture' items, but yet might discriminate very well between 'best' and 'weakest.' An example is item 6.2 — *influence on others*. By noting the discriminative value of the items we can therefore draw a more valid pen picture than the original rank orders of qualities would present.

The pen-picture of the ideal instructor is, therefore, "a man who benefits greatly from his experience; has a good voice and facility with words; has had sound occupational training and possesses a good knowledge of the work; has a broad occupational experience; makes full use of his intelligence: is acceptable to others and has a good influence on them, and is popular, self-reliant and confident."

CONCLUSIONS FROM INITIAL INVESTIGATION

To sum up this initial investigation, it was found that good and weak instructors had several characteristics in common (health, ambitiousness, good appearance, dependability, freedom from domestic worry, good bearing and reasonable physique). This suggests that these are already given considerable weight at the application and selection stage. Assuming the weight to be justified, there would seem to be little need to give selection boards any guidance on these points. But it does seem that there would be some advantage if people concerned with the selection of instructors could be told the qualities which differentiate most effectively between good and weak instructors. The pen picture given above might be the best way of doing this. It seems certain that any method of assessing instructors, whether at the selection, central training, or follow-up stage, should take the following items of the experimental form into account:

6.2 — Influence on others: leadership
2.4 — Use of opportunities provided by occupational training
3.5 — Voice
4.3 — Familiarity with words: ability to express
2.7 — Benefit from recent experience
2.6 — Knowledge of work
3.1 — Innate intelligence
3.2 — Use of intelligence
6.4 — Self-reliance and confidence
2.5 — Breadth of occupational experience
6.1 — Acceptability to others: popularity

It is not possible at this stage to say which of these items should be given the greatest weight; it may not be necessary to go into so much detail anyway, although *influence on others* and *occupational training—use of opportunities* seem to stand out by a clear margin.

It is worth noting that *type of education* (item 2.1) was to all intents and purposes a casualty of the investigation. Although this item appears last in the rank orders for 'All', 'Best' and 'Weakest' instructors it finished sixth in the order of discrimination. This discrepancy arises partly because the A, B, C and D marking referred to discrete types of education (university, grammar, technical and modern (elementary)) and not to a continuous range; and also because of pre-selection. That is to say, no instructor was university educated and it would be unusual to find grammar school products in some of the fields of activity.

The results of the investigation can of course be questioned from a scientific point of view. No attempt was made to eliminate any 'halo' effects, and it is quite possible that the whole exercise involves a tautology. An appraiser may well recognise a 'good teacher' when he sees one, but still not be able to explain in detail why he is good. He therefore assumes, consciously or otherwise, that the instructor must have a good influence on others, must have benefited from his experience, and must be intelligent and able to express himself well. Contrariwise, the weaker instructor must by definition be lacking in these 'good' qualities. Thus: What makes a good instructor? may still be too elusive a question to break down into specific elements, however unsatisfactory the stock layman's answer may be — "a good knowledge of the subject and ability to put it across".

Notwithstanding doubts about validity, the outcome of the first part of the research was that Regional Training Officers expressed themselves as well satisfied. They reported that they were using the results to guide them in the selection of instructors, and many claimed that they got a good deal of help from knowing not only the results but also the detail of the investigation which produced them.

THE FINAL ASSESSMENT FORM

The final step was the production of a simplified form, containing only those items which had been shown to have discriminative value, which could be used for appraisement at the selection stage and at any subsequent stages in the instructors' career (e.g. end of probationary period, extension of normal period of service). The lists of discrimination ratios and other rank orders were not the only guides in this part of the exercise. For example, blackboard ability had not shown up as well as had been expected. Suggested explanations by Regional Training Officers varied from the idea that the general standard was so high (or so low) that it did not discriminate well, to the notion that the good instructor had less need of the blackboard — but when he used it he used it well — and the weaker instructor needed it as a kind of compensation for other deficiencies. Wherever the truth lay, it was firmly agreed that the item should not be abandoned.

Similarly, various people suggested that important 'qualities' which had not been mentioned at the first stage should now be included — among them 'painstakingness' and 'ability to rise to the occasion'. The final form (Form 2) was thus a widely-accepted compromise. It was also agreed that if the experiment could be continued so that early assessments could be correlated with later ones, it would be as well to use a 6-point selective response rating (instead of the original 4-point). This might help to develop a finer instrument which could give an indication of the weighting to be allotted to each item.

DISCUSSION

This rather slight investigation can be regarded only as a preliminary sortie into the problem of assessing instructors in the industrial and commercial field in this country. Extensive research was carried out some years ago in the USA into the traits and qualities of a good instructor, and the findings are summarised in the *Handbook of Human Engineering Data* (Part IX, Chap. II, Section II, Table 2.1). But, as McGehee and Thayer (1961) argue, whilst these conclusions serve as a guide for selecting instructors for industrial training, their adequacy must be questioned. Most of the findings are based on the analysis of instructor behaviour in the armed forces, and in schools and colleges, and the studies report primarily on teaching in a formal class situation. They suggest that far too little is known about what makes a 'good' instructor in industry, and that the area of selection and training of instructors remains one of the most vital areas for sound research.

A considerable amount of work has also been done, and is in progress, in the related field of professional teaching, but problems and the availability of methods may be different. It has therefore been thought advisable to present this work without references to the professional field; these may have served only to obscure the issues.

The use of the NIIP Seven Point Plan for this kind of research is thought to be unique. The design and methods used in the investigation, dictated by the needs of a situation which may be common in industry but less usual in professional teaching, perhaps illustrate the need for new instruments and techniques to be fashioned by occupational psychologists. If they can be based on such well-known and well-tried systems as the Seven Point Plan, tested and verified in different situations in different industries, there is some hope that a considerable body of knowledge for more general reference could be developed. How far the present results are valid, as distinct from their being considered useful by those who helped to produce them, depends mainly on whether similar ones are obtained by others elsewhere, in identical or parallel 'criteria of occupational success' studies.

There can be little doubt that the new Industrial Training Act will have the effect of focussing attention on the crucial role of the instructor (and, next up the ladder, the training officer) in the schemes of industry and commerce. Without them, all the best-laid training plans will remain on paper; and without *good* instructors and training officers it might even be better if they did so remain. Bad training, especially training which is bad because it does not pay due regard to the uniqueness of the people being trained, could conceivably be worse than no training at all.

ACKNOWLEDGEMENTS

Although most of them have now retired, or have moved on to other work, grateful thanks must go to the Regional Training Officers and other people in the GPO who made this investigation possible by their interest and willing co-operation — and to the instructors themselves who did not know that they were co-operating. It is likely that, if they had known, they would have been just as interested and willing.

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HANDBOOK OF ENGINEERING DATA, SECOND EDITION (1952). Massachusetts: Tufts University.
MCGEHEE, W., and THAYER, P. W. (1961). *Training in Business and Industry.* New York: Wiley.
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TABLE 1: RANK ORDER OF ITEMS FOR ALL INSTRUCTORS

Rank Order	Total Score	Experimental Item	Item No.
1	693	Health	1.1
2	679	Freedom from domestic worry	7.1
3	673	Ambitiousness	6.5
4	670	Appearance	1.3
5	653	Physique	1.2
6	651	Pay incentive	7.3
7	647	Bearing	1.4
8	631	Dependability: reliability	6.3
9	611	Breadth of occupational experience	2.5
10	604	Benefit from recent experience	2.7
11	596	Acceptability to others; popularity	6.1
12	594	Voice	1.5
13	591	Knowledge of work	2.6
14	588	Use of intelligence	3.2
	588	Mobility	7.2
16	587	Social interests	5.4
17	586	Educational achievement	2.2
18	570	Self reliance; confidence	6.4
19	568	Occupational training	2.4
20	559	Manual dexterity	4.2
21	546	Continuance of education	2.3
22	545	Blackboard ability	4.4
23	541	Innate intelligence	3.1
24	540	Facility with words; ability to express	4.3
25	529	Physically active interests	5.3
26	528	Practical interests	5.2
27	507	Artistic interests	5.5
28	503	Influence on others; leadership	6.2
29	490	Intellectual interests	5.1
30	488	Mechanical aptitude	4.1
31	364	Type of education	2.1

TABLE 2: RANK ORDER OF ITEMS FOR 'BEST' INSTRUCTORS

Rank Order	Total Score	Experimental Item	Item No.
1	380	Benefit from experience	2.7
2	375	Voice	1.5
3	370	Occupational training; use of opportunities	2.4
4	369	Health	1.1
5	368	Ambitiousness	6.5
6	366	Appearance	1.3
7	365	Knowledge of work	2.6
8	363	Breadth of occupational experience	2.5
9	360	Dependability; reliability	6.3
10	359	Use of intelligence	3.2
11	358	Freedom from domestic worry	7.1
12	348	Acceptability to others; popularity	6.1
13	347	Bearing	1.4
14	346	Self reliance and confidence	6.4
15	344	Physique	1.2
16	340	Facility with words; ability to express	4.3
17	333	Innate intelligence	3.1
18	330	Pay incentive	7.3
19	328	Influence on others; leadership	6.2
20	322	Educational achievement	2.2
21	315	Manual dexterity	4.2
22	313	Continuance of education	2.3
23	311	Mobility	7.2
24	309	Social interests	5.4
25	301	Blackboard ability	4.4
26	292	Artistic interests	5.5
27	277	Physically active interests	5.3
28	274	Intellectual interests	5.1
29	273	Practical interests	5.2
30	245	Mechanical aptitude	4.1
31	228	Type of education	2.1

TABLE 3: RANK ORDER OF ITEMS FOR 'WEAKEST' INSTRUCTORS

Rank Order	Total Score	Experimental Item	Item No.
1	324	Health	1.1
2	321	Freedom from domestic worries	7.1
	321	Pay incentive	7.3
4	309	Physique	1.2
5	305	Ambitiousness	6.5
6	304	Appearance	1.3
7	300	Bearing	1.4
8	278	Social interests	5.4
9	277	Mobility	7.2
10	271	Dependability, reliability	6.3
11	264	Educational achievement	2.2
12	255	Practical interests	5.2
13	252	Physically active interests	5.3
14	248	Breadth of experience	2.5
	248	Acceptability to others; popularity	6.1
16	244	Manual dexterity	4.2
	244	Blackboard ability	4.4
18	243	Mechanical aptitude	4.1
19	233	Continuance of education	2.3
20	229	Use of intelligence	3.2
21	226	Knowledge of work	2.6
22	224	Benefit from experience	2.7
	224	Self reliance and confidence	6.4
24	219	Voice	1.5
25	216	Intellectual interests	5.1
26	215	Artistic interests	5.5
27	208	Innate intelligence	3.1
28	200	Facility with words	4.3
29	198	Occupational training	2.4
30	175	Influence on others; leadership	6.2
31	136	Type of education	2.1

TABLE 4: DISCRIMINATIVE VALUE OF ITEMS—RANK ORDER

Rank Order	Discrim. Value	Experimental Item	Item No.
1	1.874	Influence on others; leadership	6.2
2	1.869	Occupational training: use of opportunities	2.4
3	1.714	Voice	1.5
4	1.700	Facility with words; ability to express	4.3
5	1.698	Benefit from recent experience	2.7
6	1.675	Type of education	2.1
7	1.622	Innate intelligence	3.1
8	1.616	Knowledge of work	2.6
9	1.568	Use of intelligence	3.2
10	1.546	Self-reliance and confidence	3.4
11	1.464	Breadth of occupational experience	2.5
12	1.403	Acceptability to others; popularity	6.1
13	1.358	Artistic interests	5.5
14	1.343	Continuance of education	2.3
15	1.328	Steadiness, dependability	6.3
16	1.292	Manual dexterity	4.2
17	1.269	Intellectual interests	5.1
18	1.234	Blackboard ability	4.4
19	1.220	Educational achievement	2.2
20	1.207	Ambitiousness	6.5
21	1.204	Appearance	1.3
22	1.156	Bearing	1.4
23	1.140	Health	1.1
24	1.124	Mobility	7.2
25	1.115	Freedom from domestic worry	7.1
26	1.114	Physique	1.2
27	1.112	Social interests	5.4
28	1.100	Physically active interests	5.3
29	1.071	Practical interests	5.2
30	1.029	Pay incentive	7.3
31	1.009	Mechanical aptitude	4.1

FORM 1: ORIGINAL ASSESSMENT FORM

	X Applies	Tendency to X	Tendency to Y	Y applies	
X	A	B	C	D	Y
1. PHYSICAL MAKE-UP					**1. PHYSICAL MAKE-UP**
1. Health excellent; good sickness record.					1. Health very poor; bad sickness record.
2. Robust physique; strong and hardy.					2. Poor physique; weak, soon collapses under strain.
3. Appearance clean, neat and tidy, well dressed but not over-dressed.					3. Slovenly in appearance; 'spivvy', or over-dressed.
4. Bearing excellent; moves, sits and stands well.					4. Moves, sits and stands very badly.
5. Voice pleasant and well modulated; variety in pitch, power and pace.					5. Voice unattractive, (harsh, dull, monotonous, squeaky or heavily accented).
2. ATTAINMENTS					**2. ATTAINMENTS**
1. Type of education (A=University B=Grammar)					1. C=Technical, D='Elementary' or 'Modern' types of education.
2. Educational achievement excellent considering type of education.					2. Educational achievement very poor considering type of education.
3. Has continued his education and retained his interest.					3. No interest in furthering his education and content to vegetate mentally.
4. Occupational training good—has made full use of opportunities.					4. No occupational training; no use made of opportunities.
5. Occupational experience wide; has benefited fully from occupational changes.					5. Occupational experience narrow; no benefit from changes of occupation. Bad employment record.
6. Knowledge of work both wide and detailed.					6. Narrow and superficial knowledge of work.
7. Has benefited fully from recent experience.					7. Has not benefited at all from recent experience.
3. GENERAL INTELLIGENCE					**3. GENERAL INTELLIGENCE**
1. *Capable* of displaying great intelligence and insight; imaginative, original.					1. *Incapable* of displaying much intelligence and insight: no imagination or originality.
2. *Normally* very alert, quick in the uptake.					2. *Normally* dull: slow to see the point.
4. SPECIAL APTITUDES					**4. SPECIAL APTITUDES**
1. Has a strong mechanical bent.					1. No mechanical bent whatsoever.
2. Manually very dexterous; quick and sure with hands.					2. Slow and clumsy with hands.
3. Great facility with words; easily makes himself understood in conversation, discussion and teaching.					3. No facility with words; cannot make himself understood in conversation, discussion and teaching.
4. An excellent blackboard artist.					4. Absolutely useless at blackboard drawing.
5. INTERESTS					**5. INTERESTS**
1. Strongly intellectual; likes abstract ideas.					1. No intellectual interests at all; dislikes abstract ideas.
2. Strongly practical; a keen constructor and craftsman.					2. No practical interests at all; not interested in making things.
3. Strongly physically active; fond of sports and outdoor activities.					3. No interests of a physically active nature; does not engage in any sports or outdoor activities.
4. Strongly social interests; likes companionship, parties, dances, entertainments.					4. Dislikes social contacts and companionship; prefers to be alone; a solitary individual.
5. Strongly artistic interests, e.g. paintings, music, literature.					5. No artistic interests at all; dislikes or is indifferent to painting, music, literature.
6. DISPOSITION					**6. DISPOSITION**
1. Readily acceptable to other people; popular.					1. Does not get on well with people; unpopular.
2. Has a strong influence on others; accepted as a leader.					2. No influence at all on other people; a 'follower'.
3. Steady, dependable, fully reliable.					3. Erratic and unpredictable; unreliable.
4. Completely self-reliant and confident without 'bounce'.					4. Lacks confidence; always looking to others for support.
5. Ambitious: anxious for more scope.					5. Quite unambitious: does not want to change present way of life.
7. CIRCUMSTANCES					**7. CIRCUMSTANCES**
1. Free from domestic worries.					1. Unsettled domestic life.
2. Fully mobile.					2. Cannot leave present home.
3. Views instructing as means of getting higher salary.					3. Content with present income.

FORM 2: FINAL ASSESSMENT FORM

Please tick appropriate column
—A B C D E or F

X	A X Applies	B Strong tendency to X	C Tendency to X	D Tendency to Y	E Strong tendency to Y	F Y applies	Y
1. Rises to the occasion when hard pressed.							1. Usually overwhelmed by heavy pressure of work.
2. Contributions always constructive and well thought out.							2. Contributions unhelpful, superficial.
3. Voice very pleasant and well-modulated, variety in pitch, power and pace.							3. Voice somewhat unattractive (harsh, dull, monotonous, squeaky, etc.)
4. Takes exceptional trouble; works hard.							4. Not very painstaking; couldn't care less.
5. Wide and detailed knowledge of work gained by formal training or changes of duty.							5. Lacks grasp of essentials of work and background knowledge.
6. Good facility with words; is very effective in conversation, discussion and teaching.							6. Poor command of words; finds difficulty in expressing in conversation, discussion and teaching.
7. Normally very alert; quick in the uptake; imaginative; original.							7. Normally dull; slow to see the point; lacks imagination and originality.
8. Inspires considerable confidence in the class.							8. Seems unable to inspire any confidence in the class.
9. Makes constructive use of the blackboard — good layout, writing and drawing.							9. Makes no constructive use of the blackboard.
10. Has made the most of his opportunities and appears to be able to profit greatly from experience.							10. Has made little or no use of his opportunities; does not appear to be able to learn much by experience.
11. Readily acceptable to other people; has good influence on others.							11. Does not seem to get on very well with people; unlikely to influence.
Total markings							
Weighted Totals							Total score ☐

GENERAL REMARKS (Please use this space to amplify your markings *if you wish. In any case write a pen-picture of the instructor overleaf).*

Editorial Notes:

The reverse of this form, which is not reproduced, contains spaces for identifying information and for an assessment to be made of potential on the following 6 point scale:

A — stands out as having exceptional potential, above nearly all other instructors.

B — markedly better than most instructors, without being positively outstanding.

C — no serious shortcomings, but not having markedly more potential than most.

D — definite weaknesses suggest has less potential than most but may later be good enough to 'get by'.

E — will need a great deal of help to reach even a passable standard.

F — would not seem to be suitable; may be some good points but is unlikely to improve.

Programmed Training in a London Store

By JOAN TAYLOR and R. L. REID

College of Education, Aberdeen, and the University of Exeter

IN 1962 two short programs for training sales assistants in a large London store were written by Dr Taylor in consultation with the training staff of this store. One program on *cash* transactions has now been in use for almost a year as part of the training scheme for all new sales assistants and some of the results kept by the store are given below. The other program on *account* transactions is at present shaking down into regular use.

THE PROGRAM

A small-step linear program following the technique of rule-and-example was written and revised after results had been obtained from paid subjects in Aberdeen and from groups of trainees at the store. The program consists of 40 teaching frames together with a set of graded practice bills. It includes instructions on how to fill in a bill, on the 'cash' and 'despatch' systems, and on the use of the delivery guide. Each item is presented on a separate piece of paper of the same size as the bill form because these forms are used at various points in the program. Correct answers are given on separate sheets immediately after each item. This method of presentation focuses attention on one program item at a time and it makes it easy to check responses because there is no risk of distraction by program items during the checking process. Almost all of the frames require a written response and the instructions emphasise careful checking of each response. The program is made up in the form of a pad of sheets held in a ring binder attached to a frame.

Results were obtained from testing trainees after the final version of the program had become part of routine induction training. The test covered the information which the Training Department considered that trainees should know. It contained open-ended questions requiring short answers, for example, 'Where is the top copy of the bill sent?' The total possible score was 19. The 142 trainees whose results are given below represent the intake over a period of four months.

RESULTS

		Number	Range of Errors	Mean Test Score Per cent
Female	under 30	54	0-8	90
	over 30	14	0-7	88
Male	under 30	38	0-4	91
	over 30	14	0-4	93
Male	unspecified	11	0-4	88
Female	unspecified	11	0-3	90
	TOTAL	142	0-8	90

Differences between men and women and between the two age groups are not significant.

DISCUSSION

Average scores are satisfactorily high and very few individuals score lower than 70 per cent. The range of errors extends to 8, but the sample includes a few trainees who are not native speakers of English. There is no indication that older trainees are any less successful than younger, or that women and men reach different standards. (A timed trial of an earlier version of the program showed no differences in *speed* of working. N = 152, mean time 62 min., range 45-80 min.).

Originally it had been hoped that some satisfactory method of assessing proficiency on the job immediately after training would have been found, but the situation in which small numbers of trainees are sent out to a large number of small departments made it unlikely that comparability of assessments could be ensured.

The store considers that the program is successful and continues to use it as a matter of routine. Rather surprisingly the fact that the program takes roughly half the time that was taken by the classroom methods that it supplanted is not regarded as its main advantage. Instead, the training department expresses its relief at getting rid of one of its least welcome recurrent chores. The program is popular with the trainees and it avoids the difficulty and embarrassment experienced especially by older trainees in the classroom training situation. The supervisory staff who receive the trainees consider that it is an advantage that they are reaching a more uniform standard of competence after programmed instruction.

The same approach to teaching a sales system has been successful in a second London store. In this case it has been found that the program can have the extra function of enabling the training staff to pick out trainees who find difficulty in reading or in working quickly.

ACKNOWLEDGMENT

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Book Reviews

Training in the Clothing Industry: A Study of Recruitment, Training and Education. By EUNICE BELBIN and ROBERT SERGEAN. London: Twentieth Century Press (1912), 1963. Pp. 199. Price 7s. 6d.

This is a report of an investigation into the present and future training and education requirements of the clothing industry, together with recommendations on how these requirements might best be met. The investigation differs in important respects from previous studies of training in industry; it is of a kind which must become more common if attempts to improve training are to be effective. It could well serve as a pattern for subsequent studies, providing that the usefulness of such studies is properly recognised.

Given the training situation in industry as it has been — woefully inadequate in both quantity and quality — at least two needs can be distinguished. First, the inadequacies must be clearly shown up in order to create a concern for improvement amongst those who could do something about it — employers, unions, and Government. Second, having convinced them that improvements are necessary, they must be provided with guides to appropriate action. These guides should include not only technically sound recommendations on the nature and content of training courses, but also suggestions on how acceptance of the recommendations can be won amongst those who are 'anti-training,' and on how the recommendations can be made practicable.

Perhaps the most effective way of meeting the first need is to survey training practises over a wide range of industries. Existing studies of training have done this; they also have in common the feature that they have concentrated on just one level of training, such as operator training, or apprentice training, or supervisory training. Each survey has been very comprehensive within its chosen area. In sum, they have provided sharp illumination of the overall training situation. They have done much to stimulate an informed concern both in some industrialists and in Government circles. These studies have not been solely concerned to describe the weaknesses of the present training situation; they have also led to recommendations for the improvement of training, the second need mentioned above. However, it is doubtful whether they are entirely suitable for meeting this need. They suffer from three disadvantages when it comes to making concrete recommendations. First, because the studies have been based on a number of industries, they have not considered the peculiar circumstances and needs of individual industries. There is therefore the danger that to many industrialists the recommendations will appear so general as to be irrelevant to their particular industry. Second, the studies have not considered why the training situation is as bad as it is. Information about this is important for an appreciation of the true size of the problem of bringing about improvements in training. Third, because they concentrate on just one level of training, they may induce a piecemeal approach to training in industry. They cannot give adequate consideration to the problems of devising an overall training policy which covers all levels from operators through to managers. These disadvantages do not diminish the usefulness of the studies, but they do suggest that a different approach is required if the second need, the provision of concrete guides to action, is to be adequately satisfied.

The most profitable kind of approach would seem to be separate studies of individual industries' training practices and requirements. By limiting the study to just one industry, the whole spectrum of training could be considered. The justification for taking an industry as the unit of study is that many of the training problems will be common to a large number of firms in the industry; furthermore, the obstacles to the improvement of training — which may reside in management attitudes, or in union fears, or even in the nature and structure of the industry itself — can probably be most effectively tackled at the industry level. There is usually a central body of employers and/or union representatives which can serve as the vehicle for the persuasion and propaganda needed to overcome the obstacles.

The Belbin-Sergean study in the clothing industry demonstrates this kind of approach. To the reviewer's knowledge, it is the first of its kind: also, it is an excellent example of how such an enquiry should be carried out. For these reasons alone the report should commend itself to all who are concerned with the problem of improving training in industry. The success of the study can be attributed to the fact that it was conducted by independent research workers who not only have wide experience of training problems in industry, but are also thoroughly versed in the techniques demanded by this sort of work — sampling, observing, interviewing, and devising questionnaires. This point is made for the benefit of those industrialists — and there are many of them — who believe that familiarity with the industry is the sole criterion for investigators engaged in such work.

The professional competence with which the study was carried out is clearly demonstrated in chapter 2 of the report, where the method is described. The thoroughness of the study is impressive. The writers took great pains to obtain a representative sample of firms in the industry. This is important if a true measure of the nature and size of the training problem is to be obtained. The writers collected information by making personal visits to 112 firms in their sample, and by sending questionnaires to the remainder. They also sent questionnaires to technical colleges, to students taking the City and Guilds examinations in clothing subjects in 1961, to university appointments boards, and to local secretaries of the National Union of Tailors and Garment Workers. Finally, the writers met or corresponded with a wide variety of other persons belonging to or having knowledge of the industry.

Two chapters are devoted to a description and discussion of present training practices in the industry. All levels of training, from semi-skilled jobs to management, are included. The writers classify various practices under such headings as 'Where training is given,' 'Who gives training,' 'How,' and 'Extent.' Although very few statistics are given it is clear that the provision of systematic training is the exception rather than the rule; 'sit-by-Nellie' is by far the commonest form of training. This part of the report should disturb those clothing employers who remain complacent about their training arrangements. The writers could have gone on from the information they had collected about good and bad practices and the knowledge they had acquired about the jobs in the industry to formulate recommendations for improving present practices. However, as was suggested above, this is not really very satisfactory. To the writers' credit they have recognised this. Throughout their investigation they were occupied with trying to understand why training practices are as they are; what factors have hindered their development and are likely to prove obstacles to their future improvement. Implicit in the whole report is the conviction that the improvement of training cannot be brought about simply by analysing jobs more thoroughly, and by laying down programmes and syllabi of training. Equally important are, first, the setting up of an organisational framework for training which must be adapted to the needs and problems of the industry, and second, the creation of an atmosphere (or 'climate of opinion') within which training will be accepted and developed.

Chapters 1 and 3 are an outcome of this approach. The first chapter describes the nature and structure of the industry, its methods of production, and its labour force. Chapter 3 discusses the industry's recruitment policies, practices, and problems. The two chapters provide a perspective for the account of training practices which follows. They reveal many factors which clearly could inhibit the development of improved training schemes unless the schemes are planned specifically to take account of them. Examples of these factors include: the very high proportion of small firms in the industry; the high proportion of women in the labour force; the variety in the product, in terms of type, quality, and quantity of garment made; the diversity in the methods of manufacture; the primitive working conditions of many firms; the difficulty of recruiting labour in many areas, particularly in the traditional centres of industry. In the chapters on training practices the writers discuss another fundamental obstacle to improved training — the rather more intangible factor of management attitudes. They not only point out that negative attitudes are widespread, but they distinguish between various attitudes and classify the commoner ones. They also examine the reasons given by managers for not training, to see how far these can justifiably be regarded as giving rise to the attitudes, and how far the reasons are a rationalisation for the attitudes. This approach is noteworthy because it attempts to understand management attitudes, rather than simply condemning them for being negative — a very necessary step if an attempt is to be made, as it should, to change these attitudes.

Having described the situation of the industry as it is at present, the writers discuss in another chapter likely future developments in the technology of the industry. This is a further example of the writers' concern to view training as an activity which must be related to the broader requirements of the industry. It is clearly desirable to have these technical trends in mind when planning improved schemes of training.

The writers' recommendations are presented in the final chapter of the book. Because of their thoroughness in surveying the factors which can influence training, their recommendations carry the stamp of realism. They consider first the sort of organisational framework required, recognising that practical organisation must play a key role in implementing any steps to promote the progress of training in the industry. They suggest that a central training council and/or a research association is a fundamental need: this would help to solve the problems arising from the large number of small firms in the industry. The prime function of the central body would be to promote on behalf of the industry as a whole activities of a type that could not be adequately supported by individual firms. They then go on to discuss the problem of obtaining management co-operation. This would probably be the crux of any attempt to improve training anywhere. The writers stress that in the clothing industry there needs to be a radical change in management attitudes, and in management policy and practice, if progress in training and education is to be more than nominal. How the change is to be brought about is not so clear. The writers say that the most desirable way of achieving progress would be through the voluntary co-operation of employers, but recognising that this might not be forthcoming they suggest that the answer may lie in Government intervention and some sort of compulsion to train. (To put the suggestion into historical perspective, it should be added that this chapter was already in draft at the time of the appearance of the Government White Paper on training). However, the fact that the Government has now made statutory provision for some degree of compulsion to be exerted eventually on recalcitrant employers should not delude anyone into thinking that this is *the* solution to the problem. Compulsion will always be a poor alternative to persuasion, if only because it is unlikely to change attitudes. Perhaps a good deal more thought could be given to this question of persuasion. The writers of the report have provided a basis for thought in their earlier analysis of the nature of management attitudes, but they do not use the information themselves to suggest ways of changing these attitudes. Here is a problem on which the psychologist should be peculiarly qualified to offer advice.

The writers conclude their recommendations with some fairly detailed suggestions on the nature and content of training courses for sewing machinists, semi-skilled workers outside machining, and for those engaged in higher skills. These suggestions reflect the writers' knowledge and experience of good training techniques: they should be especially useful to those whose knowledge of current theory and practice in the field of training is limited. The writers' own comment on these suggestions is worth quoting, because it sums up in a few words the spirit of the whole report. 'These suggestions are not intended to be either final or comprehensive. What has been stressed above all . . . has been the need for a new approach to training, for co-operation, and for new forms of organisation. Given such essential components the more specific requirements and content of training can best be settled by the industry itself.'

The report is of course aimed primarily at employers, personnel officers, and training officers in the clothing industry. It is fortunate, however, that it is readily available to a wider public, for it can be read with profit by anyone who is interested in, and concerned about the training problem in industry.

R. G. T. MORGAN

The Management of Ineffective Performance. By JOHN B. MINER. New York: McGraw-Hill, 1963. Pp. ix+369. Price 62s.

Professor Miner offers us a book about ineffective employees — how to recognise them and how to deal with them. I suggest his offer should be firmly declined.

But let me admit that my judgement is clouded; I felt like this before I read the book. I was angered by the dust jacket. I imagine the description of the book on the inside flaps was written by a circus proprietor to the accompaniment of rolling drums and fanfaring trumpets. Let me quote, and in case anyone thinks I am exaggerating, let me assure them that only the parentheses are mine:

> "The author (fanfare of trumpets) develops his thesis by offering (roll of drums) new viewpoints and theoretical conceptualizations. In achieving this, he presents (fanfare) his theory of intelligence; (clash of cymbals) a definition of mental illness (cymbals) and a classification of emotional disorders; (cymbals); a new approach to human motivation at work; (cymbals) and (with a roll of drums) a reconceptualization of the relationship between supervisory behavior and work productivity. Factors (with muted drums) related to the span of control, the formulation of retirement policies, and the rate of conformity in the business organization receive new attention. He also provides (fanfare) a new formulation of the relationship between cultural values and the level of work performance (cymbals); a theory of accident proneness (cymbals); a discussion of the special problems associated with work in foreign countries (cymbals) and a theory on the factors contributing to failure in managerial positions (cymbals) . . . . .
>
> "(The book) offers (roll of drums) an original solution to a previously unsolved problem, and it contains the (cymbals) only (cymbals) existing collection of cases (cymbals) describing failure in the business world at the level of the individual employee."

And now Professor Miner, in a dare-devil, death-defying dive, never previously attempted in the history of psychological literature, will plunge fifty feet, from the top of the tent, in flames, into a saucerful of mescaline. Hurry, hurry, hurry — it's new, it's exciting, it's in the shops NOW. Get Pop to buy it for you. Send the cover with one dollar to Psychosuperman and get your very own do-it-yourself atomic psychiatric kit.

I would like to add another new theory to the imposing list produced by Professor Miner; that there is a high negative correlation between the dust jacket blurb and the contents of the book. If this is so, and it seems a good working hypothesis, then I am wrong to complain about the blurb — it gives an excellent negative indication of the contents. The trouble is that this is easy enough to say; it remains difficult to avoid being influenced. In this instance, for example, I was 'conned' into reading the book a second time — a waste of several hours — in an attempt to find some degree of reconciliation between cover and contents.

One example of the inadequacy of the contents should suffice. We are promised, on the jacket, a classification of emotional disorders; but inside the cover we are told:

> "No effort will be made to provide the reader with an extensive review of current thinking on the various types of emotional illness . . . the complex classification systems that have been developed are intended to serve clinical purposes and can contribute little to the manager's understanding of ineffective performance . . . "

All that we need to know, apparently, is that emotional disorders may be either psychoses or neuroses and that they may be further differentiated by their predominant emotion. And if the dust jacket talked you into buying the book because you were interested in the classification of emotional disorders, that, dear reader, is what you get for your money.

However, to be fair, if you went beyond the dust cover to the preface you would be aware that the book is intended for practising business managers and managers in training and such people are unlikely to feel short-changed because of the inadequacy of a promised classification. What is important is that he "must be able to determine when he is dealing with an emotional disorder in a subordinate, and a knowledge of symptoms will help him to acquire a sensitivity to the existence of problems in this area." There follows what is virtually a list covering some three pages and amounting to somewhere between 150 and 200 'symptoms'. From this the manager can learn to appreciate from even such faint clues as attempted suicide, homicidal attack and rape that a possible emotional disorder exists. Later the manager is warned that it is probably best not to recommend treatment unless performance has suffered. "Should a manager take it upon himself to announce his diagnosis to a subordinate when the man's performance is satisfactory he will run the risk of arousing considerable resentment not only in that individual but in the group as a whole." Professor, you sure aren't kidding. And how did the group get in on the act? Did our manager toy with the idea of announcing his diagnosis publicly?

I feel a little ashamed of splashing all this heavy irony about. The misfit in industry is a real problem and maybe this book will result in someone, somewhere managing just a little bit better; but I remain offended by the blurb and I regard the book as unrealistic. The very first sentence of the preface begins "A book is rarely written merely because the author decides he would like to publish something . . . " I wonder, I wonder.

M. H. BROLLY

Social Casework: Principles and Practice. By NOEL TIMMS. London: Routledge and Kegan Paul, 1964. Pp. vii+248.

Mr Timms is one of the best-known social caseworkers in the business. He came into the limelight in the early days of the Pacifist Service Units (now Family Service Units) and was later responsible (with A. F. Philp) for *The Problem of the Problem Family*, notable for its scientific approach to a thorny social issue. He has since gone over to the teaching side, as Lecturer in Mental Health and Applied Social Studies at the London School of Economics. His reputation is such that we should listen with great care to what he says.

Why then does an occupational psychologist have to confess to disappointment? As a mine of reference information for the social worker under training (and having to pass examinations at the end of it) this book is probably without parallel; in no other place do we find certain of the British sources covered with such thoroughness. One might even say that the student could dispense with his card index — for some aspects of his training — and use Timms instead; there are 256 references in the nine chapters. Erudition does not in itself attract adverse criticism, but one may question the value of some of the sources he quotes. There are for example many on the level of simple expressions of points of view from correspondence columns of some of the 'trade journals.' It is time that British social casework offered something more substantial.

It is possible that Mr. Timms has overstated his intention by adding the 'Principles and Practice' subtitle without deciding whether he really wanted to deal with both. More important, Mr. Timms does not seem to have made up his mind whether principles should be stated, hypothetico-deductive fashion, as those from which practice must flow; or whether practice should be examined so that principles may be educed from it. The reviewer admits to the latter, Baconian sort of predilection; others may not agree, but are entitled to know what relationship an author sees between the two.

There is in fact more about practice than principles in this book, and this is probably as it should be in the present state of social work — riven as it is by the pro- and con-Wootton schools of commonsense versus Freud. A better title would have been something like 'Social Casework in Britain.' Chapter Five and onwards give the student (including established industrial welfare officers and others on the fringe of social casework as practised by the academically-trained professional longstops) an outline of medico-social, probation, child-care, family and psychiatric-social work in this country. For this we must be grateful, even though some of the sections are insecurely based on single cases described at length. There is surely more to psychiatric work in a mental hospital than the history of 'Vera' would suggest.

It is in the 'principles' area that the author's offering is slimmest and most patchy. On the credit side there is commonsense about confidentiality. There is also a neatly penetrating summary of the three historical phases of marriage guidance: emphatic intervention and advice, neutral clarification, and the proper understanding of the marital relationship. The last of these is quoted with approval as 'a fresh attempt to understand each marriage in the light of certain psychodynamic principles.' All well and good, apart from two clear implications which many readers will reject. The first is that emphatic intervention and advice, and neutral clarification, are now 'out.' This is certainly not the experience of many working in the marriage guidance sphere, who use all three techniques according to need. Second, we are led to suppose that only those who can follow the twists and turns of Freud and his derivatives, disciples and deserters can achieve 'a proper understanding of the marital relationship.'

Mr Timms appears to take this line, not only in marriage guidance but in all casework. More charitably, he implies it by confining his very brief section on psychological theories to the work of these schools and anti-schools. His thumbnail picture takes in Jung, Klein, Mowrer, and Miller and Dollard (also, careful scholar, Dollard and Miller) but that is about all. One looks in vain for a mention of Eysenck or Vernon, being forgiven for having obtained the impression elsewhere that there might be something in behaviour therapy and personality assessment. The occupational psychologist could also be forgiven for thinking that his own discipline has contributed something to the pool of knowledge of men and women. A reviewer does not operate with a fine-tooth comb, but, beyond a passing reference to the possible worker role of a father, this one failed to find anywhere a mention of the fact that most of the people under the charge and care of social workers themselves work for a living.

This is really too bad of Mr Timms. He had a suitable place in his subsequent section on 'Knowledge of Society,' but he just did not make use of it. He tells us that "knowledge of the social services is clearly part of the social worker's equipment" (surely a sine qua non?); he mentions Townsend's work on the residential care of the elderly; he gives us a bit about social class and the family. But about work, its stresses, strains and satisfactions, there is nothing at all. It is indeed sad if our would-be social workers are being led to suppose that they can deal with people in the abstract, and never take into account the fact that most of them spend nearly half of their waking lives earning their bread and butter.

Elsewhere (*New Society*, 3 September, 1964) Mr Timms has said: "Definitions of social work are usually too wide or too narrow. Thus, 'helping people to help themselves' embraces the burglar's mate." Burglar's mate notwithstanding (and we can excuse the somewhat sick and slick humour) it is very difficult to think of a more succinct, useful, and psychologically sound statement of the purpose of social work, than helping people to help themselves, and, as a corollary, not standing between the man and his problem. If those who teach the subject could bring themselves to adopt the definition, there might be a chance of leading the student out of the mystical blind alley of egos, superegos and ids and into the real workaday world where people are supervised, instructed, paced, bored, frustrated, dirtied, injured and killed as well as fulfilled, satisfied, made happy and often advised and helped by those who know something of common humanity and its day-to-day problems.

ALEC MARTIN

Work Values and Background Factors as Predictors of Women's Desire to Work. By LORRAINE DITTRICH EYDE. Research Monograph Number 108. Ohio: Bureau of Business Research, Ohio State University, 1962. Pp. ix+88.

This monograph describes an empirical study of the personal and educational backgrounds of college trained women in relation to their attitudes and motivation to work outside the home. The women who participated in the study were graduates of Jackson College, Massachusetts, the first sample consisting of those who were finalists in 1958, whose attitudes were assessed just prior to graduation, and the second sample of graduates of five years standing, the 1953 class, whose attitudes were likely to have been influenced by their experiences since leaving college. A rating scale was devised to measure desire to work, that is an estimation of the continuity and length of employment anticipated under varying conditions, such as when single, married with young children, married with older children, with husband's salary adequate, with husband's salary inadequate, and so on. As the respondents had experienced few of these conditions, their estimates of their likely work behaviour, as the author acknowledges, need validating by future follow-up studies. For the purposes of this enquiry, however, desire to work as indicated by these ratings was taken as the criterion to be predicted from the other measures used. These were a work value scale and a questionnaire on relevant background factors such as home and family attitudes, social activities and economic circumstances. Prediction weights for these items were calculated from the responses of the first sample, i.e. the 1958 group, and were then tested on the 1953 sample; later those developed from the responses of the latter were tried out on the former.

The results are much as one would expect. Both samples showed similar patterns of work motivation relating to marital status, financial circumstances and to number and age of children, which correspond to the cultural norms for American women as revealed by official statistics. The older group were found to have more realistic attitudes and greater appreciation of the effects of job experience, further education, marriage and motherhood upon their desire to work than the women in their final year at college. Hence proportionately more variables predicted the work motivation of the older women.

The choice of these particular samples for an enquiry of this kind is rather puzzling, but one suspects that, as so often, their availability was the determining factor. If, as is suggested in the introduction, the investigation becomes part of a longitudinal study of women's attitudes to work, its value will be enhanced and we can wait with interest to see how far 'desire to work' scores indicate future work behaviour. If no such follow-up is made the enquiry loses much of its point. Too little attention seems to have been given to the difference between necessity and choice in determining whether women will seek paid employment outside the home, nor to the effects of varying opportunity. Some women have a keen desire to work in their chosen professions, but will not contemplate any other kind of work; others, for a variety of reasons, are anxious to have a job and are much less particular as to what kind of work is entailed. The present study throws little light on differences of this kind. It is recommended to research students in particular for serious consideration before they embark upon their own projects; those who are attracted to a similar type of enquiry will at least be challenged to think again.

SYLVIA SHIMMIN

The Enterprise and its Environment: A System Theory of Management Organisation. By A. K. RICE. London: Tavistock Publications, 1963. Pp. xiv+364. Price 63s.

This is an apparently rather muddled book about what may prove to be a very good idea. It contains a personal story of the author's consultant relationship extending over eight years with a large, growing, diversifying enterprise, and it presents a new theory of organisation, illustrated mainly by reference to that experience. It is a sequel, to, but independent of, an earlier publication entitled *Productivity and Social Organisation* (1958).

Part I describes the consultant relationship, outlines the origins of this particular work and states some concepts and assumptions that underlie it. Part II recapitulates the story already told and carries it forward rapidly to end with a review supported by graphs of the success that has attended the firm through the eight year period. Part III supplies some 'biographical' details about the constituent companies (for example, on interlocking directorates) and discusses the consultant's practical problems and his application of theoretical concepts to their solution. Part IV consists of 100 pages of discussion, and there are 80 pages of 'working notes' published in response to requests that the author should demonstrate his methods of working.

At times the story reads like a novel. Students of management interested primarily in the development of the organisation may resent intrusive comments about the author's personal feelings which are, however, relevant when it is recalled that consultancy provides the frame of reference. Chapter I should be read with care.

The system propounded as an aid to critical analysis of manufacturing (and other) organisations bears the stamp of common sense and logic. It is put forward in terms meant to facilitate practical tests, with the claim that organisations operating on the principles described will be best able to achieve their ends. Features of certain organisations known to the reviewer, and internally recognised as weaknesses, would immediately be highlighted by routine application of Rice's theoretical model; but independent evidence of the effect of changes made in accordance with this model will be difficult to acquire because allowance must so often be made for personal idiosyncracies, as the author himself points out.

Mr Rice has had many years of industrial experience, latterly in association with the Tavistock Institute of Human Relations. Much of what he says in this book could throw light on commonly observed industrial behaviour; his chapter on delegation, for example, is likely to prove particularly illuminating. The pity is that the three essential ingredients — the story of one enterprise, the author's personal feelings and explanations, and the theoretical formulations — each with inherent qualities, seem neither fully integrated nor fully disentangled. There is a bibliography of some 60 titles, almost half of which refer to Tavistock works; the remainder are well selected from British and American writing. The book should be of interest to teachers of management and mature students but it may tax the time and patience of executives for whom its ideas should have practical utility.

ISABEL BLAIN

Appraising Vocational Fitness. By DONALD E. SUPER and JOHN O. CRITES. New York: Harper, 1962. Revised Edition. Pp. xv+688. Price $6.50.

Not being a drastic revision, this second edition of Super's well known book retains the merits and demerits of the first. The authors, for Crites joins as co-author in the second edition, have three objectives: first, to discuss the basic procedures in the development and the use of vocational tests and thereby help the test consumer to acquire the technical knowledge with which to evaluate, select, and use tests in selection and vocational guidance: second, to provide a detailed guide to the research findings, relating to the most widely used vocational tests: and third, to familiarise the reader with the bibliographical sources relating to vocational tests.

The authors achieve their objectives, but within narrow terms of reference which they fail to make explicit. The test they survey are those most widely used in the U.S.A., and the research they review is almost entirely confined to American publications. Out of a thousand or more references, less than a dozen are of non-U.S.A. origin. This extreme North American aloofness not only irritates, it can mislead. For example, the short chapter on musical talent reviews at length the *Seashore Measures of Musical Talent*, but there is no reference to Wing's *Standardized Tests of Musical Intelligence* or to Dr Wing's pertinent criticism of the Seashore. Other chapters likewise omit significant British contributions.

To the non-U.S.A. test consumer, the thirteen chapters (out of a total of twenty-two) devoted to the research findings on individual tests and inventories will be useful mainly as a source of hypothesis. The material of most of these chapters relating to individual tests is that of the first edition, with the addition of a few sentences or paragraphs bringing the review of the literature up to 1959 or occasionally up to 1960. More extensive changes have been made in the chapters relating to vocational interests and personality inventories. The *Edwards Personal Preference Schedule* is now included, and the *Kuder Preference Record* (*Vocational*) together with the *M.M.P.I.* now receives a more extended treatment. Three other measures of personality, including the *Bernreuter*, have been dropped from this second edition. Other changes are the elimination of the statistical appendix and the relegation of the illustrative cases which formed Chapters XXIII and XXIV of the edition to appendices.

The chapters which have most generality and which psychologists outside the U.S.A. may find most helpful are those relating to vocational testing and the use of tests in vocational guidance. The content seems to be very much the same as that of the first edition except that the chapter on appraising individual promise has been extended to include a discussion of clinical and statistical prediction as a part of appraisal. These chapters are full of sound advice and warnings to the test user, but some people may prefer the more detailed treatment of the issues discussed to be found in the well-known texts on psychological testing. Others may feel that the Super and Crites discussion follows too closely the traditional view that the purpose of aptitude tests is to estimate or forecast aptitudes from test scores. To them, some note of the contribution of Cronbach and Gleser, who in their *Psychological Tests and Personnel Decisions* put forward the view that the ultimate purposes of personnel testing is to arrive at decisions, would have been welcome.

JOHN R. TEASDALE

Emotional Flexibility-Rigidity as a Comprehensive Dimension of Mind. By SIGVARD RUBENOWITZ. Acta Psychologica Gothburgensia No. IV. P.A. Council Report Number 34. Stockholm: Almqvist and Wiksell, 1963. Pp. 256. Price Sw. kr. 40.

The author of this research monograph is a staff member of the Swedish Council for Personnel Administration with whose encouragement this new comprehensive study of rigidity was carried out. It was conceived as a contribution to the fuller psychological description of the adaptive, flexible personality, and with the purpose of establishing empirically a general rigidity factor.

The study set out to test the main hypothesis that "in adults a general factor of flexibility-rigidity can be identified, a factor which accounts for a considerable part of the variance in thinking, attitudes and displayed behaviour." For this self-chosen factor-analytical approach to the establishment of a major behavioural dimension, the author used 28 scoring indices. The tests from which these were derived included Swedish versions of the California F scales, Rokeach's Dogmatism and Opinionation scales, the Gough-Sanford Rigidity scale, the Edwards Personal Preference Schedule, a group version of the Rorschach technique, and measures of resistance to change, strength of political conviction, attitude towards child rearing, acceptance of modern works of art, and attitudes towards study arrangements (for a University sample of subjects). The major studies were carried out separately on young soldiers and University undergraduates. In addition to the main hypothesis, the author subjected 12 subsidiary and derived hypotheses to tests of disproof by relating the tests with the highest loadings on the rigidity factor to some external criteria of the variable.

Two Hotelling Principal Component analyses were carried out in each of which flexibility-rigidity appeared as a major factor on which the California and Rokeach Scales had the major loadings. "Lenient up-bringing" also had a sizeable loading on the major factor in each analysis. Among the external variables which the author found to be significantly related to his rigidity factor, were fear, anxiety, a negative outlook on life, and experience of parent-child relationship during childhood as relatively harsh and forbidding. These results, often previously hypothesised, may well constitute the most interesting part of this study.

The author does not seem to be aware of the work on rigidity carried out in England by Coulter, Rim, Miller, Brengelmann or Chown, and he omits to give the percentages of the total variance accounted for by each of the factors which alone would allow an assessment of the real importance of the main and other factors. A predictive study, using the relevant tests, of personnel selection for a changing industry requiring flexible staff, would have been of great interest, and this remains to be done.

VERNON HAMILTON

Organizational Change: The Effect of Successful Leadership. By ROBERT H. GUEST. London: Tavistock Publications, 1962. Pp. xii+180. Price 32s.

Importance, clarity, brevity — this book has all three. It is one of the few systematic studies of a large complex organization *in process of change*. 'Plant Y', the automobile factory which Professor Guest studied while with the Yale Technology Project, was one unit of an American corporation with 126 plants. He provides not only 'before and after' analysis, but has focussed on the change process itself, the discrete change phenomena which made the structure actually move from Form A (failure, 1953) to Form B (success, 1956).

A new manager was appointed in 1953. Success is attributed to his restructuring of the inter-action pattern of management, without further organization change. "In effect, he instituted a new way of developing, processing and implementing technical ideas." This led to better control of technical problems, better relations between managers and more time for long-term planning which further improved control. Conditions were set for an upward spiral which continued even after the new manager was promoted elsewhere.

In examining the nature of authority and the factors in success and failure, Professor Guest shows how important was the plant manager's dual role, as 'agent of higher authority' and as 'representative of Plant Y'. Perhaps the most significant and under-stressed point in this study, however, is that the new manager, unlike his unfortunate predecessor, had the confidence of the Board, was given a free hand and time to manoeuvre. Even so, his understanding and handling of the situation was exceptional, Professor Guest is correctly careful about generalisation from this case study, but believes it possible under 'generally similar conditions.' These conditions, it seems, must include an exceptional manager. The sudden introduction of a less perceptive manager can aggravate a critical situation, at least during the time taken to achieve a new equilibrium.

Professor Guest follows through in his final chapter the concept of socio-technical systems used throughout the book. He shows that assembly-line technical organization is highly sensitive to change; that mechanical or human communication breakdown can wreck the effectiveness of an entire plant; that, in consequence, the social and technical systems are inseparable. He provides unusually complete data on the key business performance indices of 'Plant Y', to avoid the error commonly made by social scientists of ignoring the *technical environment* which can determine the roles which managers play. We are not told, however, whether wages and salaries were increased during the study period.

Nor is the significance of company size established sufficiently. The giant corporation to which 'Plant Y' belonged might weather market changes and the few production cutbacks reported, without crippling or closing any plants. Smaller companies might be forced into more drastic measures for survival.

Moreover, the transmission of change from the external environment, to internal organization and, through this, to management jobs, is not fully brought out. Continuous change in knowledge and skill demands made on managers has produced, in Britain, a new focus on management development.

Finally, the excellent Review of Research on Organization, Change and Leadership, in an appendix, provides theoretical perspective for this fascinating, empirical case study.

This is not only an important book — for managers, social and occupational psychologists alike — it may well be regarded as a classic study of organizational change.

NORMAN W. BAILEY

Education for the Use of Behavioral Science. By JAMES V. CLARK. Los Angeles: Institute of Industrial Relations, University of California, 1962. Pp. 91. Price $2.25.

Professor Clark tries to answer a question "as old as Socrates": How does the teacher help his students to gain skill in utilising knowledge? The author explores the subject with the help of his own significant experiences. One is that in trying to communicate the knowledge of behavioural science to practitioners in other fields he encounters deep-seated stubborn forces. Another, perhaps, is that the built-in attitudes of some behavioural scientists are not conducive to awareness of lack of social sensitivity. He has also found that students of business are apt to be those who have already gained rewards of the kind which their social conditioning has taught them to expect. What their teacher should do is to reward, non-materially, certain non-stereotyped modes of thought, perception and feeling, to produce a classroom atmosphere which will allow for 'the up-ending experience'. As an example, he quotes a writer who asked a traffic-officer if he wanted him to move his car and release a long line of traffic. When the cop with an elaborate bow replied, "If you will, please," the driver got quite a turn. Since modern psychologists would not know what this means, it is translated simply into 'the traffic officer precipitated a shift towards an enlarged orientation of outlook'.

Clark quotes: "We must place central importance in university training — for business as elsewhere — on students' thought processes, and not only the particularised subject-matter of the present." He remarks that when a student realises that developing an enlarged orientation means changing himself, he may realise too that strong forces exist to maintain himself, particularly his image as 'executive'. All through his book, Professor Clark shows empathy with experiences which in the Dark Ages were termed 'introspective'. He chooses to quote extensively from Florence Kluckhohn's conspectus of the basic values which underlie American middle-class culture, from which most students enter graduate schools in 'this section of America.'

The first value of most Americans is mastery over Nature. It is part of man's duty to overcome obstacles; hence the great emphasis on technology. A high value is placed on change, provided that it does not threaten the existing value order, 'the American way of life'. What the individual does and what he can accomplish are almost always the primary questions in the (middle class) scale of appraisal of persons. The teacher must learn how to balance his way along this tightrope of value — conflict, inside and outside himself.

In 1953 Professor Edwin G. Boring asked "What Became of Introspection?" and in *Psychologist At Large* gave a comprehensive answer. This all-too-human tendency keeps breaking in when the teachings of behavioural science are applied to important human problems, as Professor Clark has abundantly shown.

T. H. PEAR

The Use of Psychological Tests in Industry. By LEWIS E. ALBRIGHT, J. R. GLENNON and WALLACE J. SMITH. Copenhagen: Munksgaard, 1963. Pp. 196. Price D.Kr. 30.

This is a book of less than two hundred pages and it covers almost the complete range of test work. The editor's foreword states that "it is the initial volume of a series of text books" and that "it will be part of an advanced course in industrial psychology." The last sentence is "This book should become the standard reference for personnel departments in industry and all employing institutions."

In contrast to this editorial optimism the three authors begin their preface "In this short volume we have attempted to distil some principles . . . for the benefit of those unfamiliar with the subject," and this is quite a good description of the scope of the book. People who have little or no knowledge of test work and who want to know the scope and the limitations of tests, how they can be used and how they should not be used, what tests are like and how the results of testing can be checked, will find this book very interesting. It is a short book and the chief criticism is that the authors have tried to crowd too much into too few pages. They have made very good use of the space, however, and no doubt the compactness of this book will appeal to many readers.

D. F. VINCENT

Workers Nearing Retirement. London: The Nuffield Foundation, 1963. Pp. vii+53. Price 5s.

This descriptive report is based on a series of interviews with 507 men over 55, in 48 varied firms on the Slough Trading Estate. On the whole, men had tended to leave work which involved time pressure, and felt nervous strain in jobs which imposed sudden rushes of work or responsibility for the output or behaviour of others. A high degree of job mobility existed — perhaps due to local conditions — and reasons for change included "betterment" and "increase in pay" as well as "lighter work." The older the men the less favourable their attitudes to retirement. Few had leisure pursuits, and they liked the habit of work with all its implications. One third of the men had a disability that limited their work placement. Foremen seen were quick to mention the exceptionally fit man, but claimed to be tolerant of difficulties due to ill health, to match men physically to the job in an informal way and to be tactful when formal transfer seemed essential.

A gallant attempt is made to balance quantitative and qualitative data in this report, but it is particularly valuable for the very vivid picture it paints of the industrial climate in which the older man works, the sort of job he does, and the way he feels about it. The findings as to job mobility are interesting for it is important to know that many older men were adaptable about jobs, *enjoying change*, under conditions of full employment.

SHEILA CHOWN

The Northern Rhodesia Mental Ability Survey, 1963. By R. S. MACARTHUR, S. H. IRVINE and A. R. BRIMBLE. Lusaka: Rhodes-Livingstone Institute, 1964. Pp. viii + 100. Price 21s.

In Zambia, the wealthiest of the newly independent nations of Africa, 86 Africans obtained School Certificate in 1960 and of these 17 passed Higher School Certificate two years later. These statistics alone make the case for maximally efficient selection and training procedures in modern Africa. The urgency of the situation is reinforced by the scarcity of secondary school places (the modal African country provides secondary education for less than 3 per cent of the relevant age-group), the high proportion of national budgets being devoted to education, and the long-term nature of such investment returns. This monograph reports a rapid survey, in keeping with the urgency of the problem, of the practical utility of pencil and paper ability tests for educational and occupational selection decisions in Africa.

Drawing together the results of experimental studies from most of English-speaking Africa, a battery of general ability, and scholastic and technical attainment, tests were administered to 1,600 Africans in the 6th and 8th years of education, and to a thousand others in various occupations. Validation for the school groups was either against concurrent or retrospective attainment, and for the occupational groups against supervisors' assessments. Concurrent validities at both school levels demonstrate the importance of verbal and numerical skills, and the relative unimportance of abstract reasoning. A curious feature of the predictive validities of subjects is Geography's appearance at the top of the list and the low position of Arithmetic. A similar order of magnitude was found by the reviewer in Uganda. This suggests that caution must be exercised in interpreting correlations between ability and attainment tests as measures of the validity of the former. It is evident that the criterion of overall school performance is more heavily weighted towards achievement in subjects which can be rote-learned that the 'media of thought' subjects of English and Mathematics.

In their discussion of the meaning of individual results the authors suggest that scores from English and American general ability tests should be considered as culture-controlled derivatives of Hebb's 'Intelligence B'. Evidence is presented that test performance is influenced by such extraneous factors as sex, ethnographic background, school quality and test administrator. The reviewer's experience in Uganda confirmed that school quality was an important source of variance. In a sense, then, it may be said that attainment may be the cause of measured intelligence. This can occur when, as here, we are considering relationships derived from sampling, in a second language, a restricted set of behaviours by a self-selected elite. This study thus brings out two assumptions about intelligence tests which are not generally recognised. Universal education provides a common core of culture upon which to base problem items, and over-learning of the media of the tests (whether language, pictures or patterns) provides the tools for tackling the problems. Both are necessary conditions of the attempt to define and validate concepts of intelligence against scholastic performance.

If the variance in Intelligence B is being contaminated by environmental variables such as school quality, the next research step must be towards a more representative sampling of Africans and their skills less biased towards educational experience. This would require testing in the vernacular language, and detailed study of overlearnt local skills. Certain board games played all over Africa (for example, Swahili *mtubiri*) might provide a starting-point. The aim should be intra-culturally-fair tests with a content *for the testees* analogous to existing western tests. The validity of selection procedures would be expected to improve as a result of incorporating tests more dependent on genetic potential.

One methodological point must be raised. An attempt is made to illustrate the improvement in prediction likely to be obtained by using a revised battery of tests. The best set of existing attainment tests is shown to have a predictive validity of R=.44, as against an R for the revised set of 0.75. The latter R is based upon a combination of concurrent and predictive validity coefficients. This combination can only be justified if the concurrent tests can be assumed to have high stability over the two-year period on which the predictive validity coefficients are based. This is most unlikely to be true of tests so susceptible to environmental influences.

Even without a demonstrable improvement in validity, there is clearly a good case for the use of standardized attainment and ability tests in Africa on the grounds of improved reliability and administrative convenience in marking. With the current rates of expansion in education, this is a sufficient reason in itself.

JONATHAN SILVEY

Handbook of Consumer Motivations: The Psychology of the World of Objects. By ERNEST DICHTER. New York: McGraw-Hill, 1964. Pp. xvi+486. Price 80s.

Dr Dichter has been responsible, directly or indirectly, for much of the publicity surounding 'motivation' or 'motivational' research for the past ten years or so. For a while, many people thought that psychologists in market research, and in advertising agencies in particular, were using techniques adapted from psycho-analytic methods—believing that these were largely illustrated in and inspired by Dichter's work. If this belief was once partly true, it is certainly very far from the truth now, because in recent years psychologists have been much more disposed to create special techniques tailored not only to examine the complexities of buying behaviour, but also to fit the particular philosophies and practices of marketing and advertising companies. Such techniques are related to a variety of disciplines derived mainly from experimental psychology and sociology. Methods derived from psycho-analytic theory and practice are of limited and diminishing importance. This is so largely because in commerce at any rate they are ill adapted to the objective measurements and tests of reliability and validity widely used by market researchers nowadays, and demanded not least by manufacturers and service organisations themselves.

Against this background, Dichter's *Handbook* is disappointing because it relates mainly to the stage of forming hypotheses about consumer behaviour and little to the process of proving them. It is an encyclopedia of goods and services, with comments on their 'significance' in terms of the 'meaning' they are reputed to have for those who buy them. However, none of the 2500 studies referred to are reported in full, and indeed some references, e.g. to tangerines, perfume, nervousness (*sic*) and pep pills, are apparently not based on research findings at all.

The book is addressed specifically to the 'communications expert.' This flattering title is bestowed upon anybody whose business it is to communicate anything whether in advertising, public relations or politics. For some 350 pages of the book, however, it is clear that Dichter has advertising and marketing people principally in mind; the social scientist and the general reader are also invited to look within. The writer, therefore, is somewhat greedy for readers, and one effect of this is that in attempting to satisfy many interests he has succeeded in rewarding but a few. The 'world of objects' includes foods (*tickling the palate*), clothing (*hide your nakedness*), shelter (*the velvet-lined cave*), cosmetics (*objects of love*), drugs and health (*science and magic*), toys and sports, transportation, social links and 'fun objects' like sweets and cigarettes. Finally, we are elevated to the 'structure of our world', 'motivational mechanisms' (called '*bridges to the mind*') and '*things of a higher order*' like art, books and voting. The kinds of interpretation given to these objects and values range between (a) the anthropological, (b) the anecdotal, (c) the psycho-analytic and (d) the semantic. Only in the case of psycho-analytic interpretation do we find references to research findings and these are only sketchy. The reasons why consumers buy goods or the personality types attracted to them are listed, but with few clues as to what reasons are important and what are unimportant in relation to purchasing, or to the distribution of personality types within a given population. Indeed, we are seldom told what population in a given instance *is* referred to — American, English, German or Swiss. We know that these countries at least are the sources of some of the information, but in most cases we do not know where the studies were done.

In general, the book is most likely to attract the advertising man who is desperately short of creative ideas for a particular product and wants to hear about somebody else's. He may then discover an hypothesis to test but had better proceed with caution. Supposing he wants to advertise flour and he looks up FLOUR, he will discover an example taken from Germany. If he is advertising in England, it is unlikely he can rely on that, knowing or guessing that German and English buying patterns vary considerably.

The social scientists will be most interested in chapter 12 on 'motivational mechanisms', which attempts to relate Gestalt psychology and psycho-analytic theories in particular to motivation research. This is done in a rather unsatisfactory way, however, by pursuing the piecemeal encyclopedic approach of the rest of the book. This chapter would have been much better re-written as a reasoned argument and placed as chapter I; at least this would provide some rationale for what follows. Moreover, some of Dichter's own reasoning could then be clarified. For example, he seems confused between images and symbols. We find two illustrations of images (p. 428, paras. 3 & 4) repeated, word for word, as examples of symbols (p. 443, paras. 2 & 4). This is an example of the redundancies which occur from time to time in the book, and may simply reflect on the quality of editing.

Social scientists and others can again be recommended to read those sections which are best documented, i.e. on cosmetics, soap, deodorants and smoking.

Readers — except perhaps general ones — will be much less attracted to those passages which embellish the transcripts of quite ordinary interviews and which often appear as sentimental anecdotes (cf. Wood, p. 153, and Flowers, p. 304), together with many extracts reminiscent of *The Golden Bough*. These parts of the book could be pruned with advantage and help to correct the impression of the writer as the Godfrey Winn of consumer research.

Finally, for the psychologist or social scientists in commerce, this book is of little value because it seems to be based on a false assumption. This is that consumer motives in buying goods and services are both relatively stable and universal. However, we know from our knowledge of markets and communities that this is not the case, because goods and services are constantly changing and new patterns emerge as the result of rapid social and economic developments, and the diverse activities of manufacturers and advertisers. The most, perhaps, that Dichter could write on this subject is not a handbook but a yearbook for a specific time and place.

No information in this book should be regarded as substitute evidence for original research on any aspect of communication, and the hypotheses suggested need to be substantiated much more before they are worth testing.

PHILIP L. SHORT

The Prediction and Control of Behavior. By J. D. KEEHN. London: Constable, 1963. Pp. 268. Price 45s.

Readers of Samuel Butler will recall that the school to which Ernest Pontifex was sent had a strongly Skinnerian atmosphere. So has this book. The Toulmins have remarked that the purpose of Science is not to *make* things, but to *make sense* of them; but B. F. Skinner seems to incline to the opposite view; and Professor J. D. Keehn follows him. If (like the reviewer) you agree with the Toulmins, you will find this book somewhat marred: which is not to deny it considerable merits.

The book is intended as an introduction to Scientific Psychology for first-year students with no prior knowledge of the subject. It is laid out in four main sections, comprising altogether eight chapters. The first section, 'Science and Behavior', contains a single chapter, in which the author straightforwardly states his Skinnerian viewpoint. The second section is 'Intellect and Behavior', with a particularly thorough chapter on Intelligence, and a chapter on Learning and Memory which includes an account of remembering the War of the Ghosts. The third section, 'Personality and Behavior', is divided into chapters on Personality and on Abnormal Behavior. The last and longest section—'The Analysis of Behavior' — comprises three chapters, Learning and Behavior, the Free Operant, and Motivation, which succinctly expound Skinner's views on these matters. The author wisely avoids massing experimental detail; but concentrates rather upon the central issues, illustrated by a few important experiments. The presentation is clear; the diagrams are numerous and helpful; and the author is careful to consider views with which he disagrees.

The author has succeeded in producing a sound and useful book. However, as an introductory text it must be compared with a number of excellent ones already in existence, such as Hebb's *Textbook of Psychology*, Zangwill's *Introduction to Modern Psychology* and Broadbent's *Behavior*. It is necessary to ask: If a student can afford only one such book, should he be advised to buy the present one in preference to one of the others? To the reviewer it seems that the answer is 'No', although it would form a valuable addition to the shelves of any teaching department's library.

H. HAMMERTON

Other Books Received

An Introduction to Motivation. By JOHN W. ATKINSON. Princeton, New Jersey: D. Van Nostrand, 1964. Pp. xiii+335. Price 76s.

The Psychology of Aging. By JAMES E. BIRREN. Englewood Cliffs, New Jersey: Prentice Hall, 1964. Pp. ix+303. Price 56s.

Structure in Management. By I. BLAIN. London: National Institute of Industrial Psychology, 1964. Pp. 50. Price 10s. 6d.

Behaviour. By D. E. BROADBENT. A University Paperback. London: Methuen, 1964 (originally 1961). Pp. 215. Price 9s. 6d.

Statistical Records about People at Work. By R. B. BUZZARD and J. L. RADFORTH. London: National Institute of Industrial Psychology, 1964. Pp. 22. Price 4s.

Workshops for the Handicapped: An Annotated Bibliography. By CALIFORNIA STATE COLLEGE. Los Angeles: California State College, 1964. Pp. ii+61.

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Depression. Proceedings of the Symposium held at Cambridge 22 to 26 September 1959. Edited by E. BERESFORD DAVIES. London: Cambridge University Press, 1964. Pp. xv+378. Price 80s.

Experiments in Behaviour Therapy. Edited by H. J. EYSENCK. London: Pergamon, 1964. Pp. x+558. Price £5.

Social Psychology in Treating Mental Illness: An Experimental Approach. Edited by G. W. FAIRWEATHER. New York: John Wiley, 1964. Pp. xii+300. Price 60s.

The Dynamics of a Changing Technology. A Case Study in Textile Manufacturing. By PETER J. FENSHAM and DOUGLAS HOOPER. London: Tavistock, 1964. Pp. xvi+248. Price 35s.

Influence de la Finesse de Cotation sur le Coefficient de Fidélité. By ROBERT FLANDRE. Brussels: Centre d'Etudes Sociales, Ministère de la Défense Nationale, 1963. Pp. vi+35.

Examiner's Manual for the Basic Fitness Tests. By EDWIN A. FLEISHMAN. Englewood Cliffs, New Jersey, 1964. Pp. 60.

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Structure and Processes of Civilization. By H. C. GANGULI. London: Asia Publishing House, 1964. Pp. xi+184. Price 35s.

Personnel Management in Developing Countries. Edited by J. E. GENDERS. London: Institute of Personnel Management, 1964. Pp. 60. Price 10s. 6d.

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Job Re-Design. By STEPHEN GRIEW. Paris: Organisation for Economic Co-operation and Development, 1964. Pp. 86. Price 15s.

The Effects of Mass Communication with Special Reference to Television. By J. D. HALLORAN. Leicester: Leicester University Press, 1964. Pp. 83. Price 7s. 6d.

The Future of Supervisory Training in the Thurrock Area. By PETER HARRIS and KEITH THURLEY. Thurrock Technical College, 1964. Pp. 35.

Learning. A Survey of Psychological Interpretations. By WINFRED F. HILL. London: Methuen, 1964. Pp. x+227. Price 9s. 6d.

The Nature of Psychotherapy. By KARL JASPERS. Manchester University Press, 1964. Pp. x+49. Price 7s. 6d.

Repercussions of Redundancy. By HILDA R. KAHN. London: Allen and Unwin, 1964. Pp. 267. Price 50s.

Guidance in American Education: Backgrounds and Prospects. By EDWARD LANDY and PAUL A. PERRY. Harvard University Press (London: Oxford University Press), 1965. Pp. 175. Price 24s.

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The Selection Process: Choosing the Right Man for the Job. By MILTON M. MANDELL. New York: American Management Association, 1964. Pp. 512. Price $15.00. A.M.A. Members $10.00.

The Marianne Frostig Developmental Test of Visual Perception, 1963 *Standardization.* By PHYLLIS MASLOW, M. FROSTIG, D. WELTY LEFEVER and J. R. B. WHITTLESEY. Perceptual and Motor Skills. Monograph Supplement 2-V19, 1964. Pp. 463-499. Price $3.00.

Writers on Organizations. By D. S. PUGH, D. J. HICKSON and C. R. HININGS. London: Hutchinson, 1964. Pp. xii+98. Price 15s.

Meeting Today's Responsibilities for Tomorrow's Managers. By SIMON RAMO, MASON W. GROSS, J. W. HULL and LAWRENCE A. APPLEY. California: Industrial Relations Center, California Institute of Technology, Pasadena, 1964. Pp. 53. Price $2.50.

Approaches, Contexts, and Problems of Social Psychology. Edited by E. E. SAMPSON. New York: Prentice-Hall International, 1964. Pp. ix+576. Price 72s.

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Spatial Ability: Its Educational and Social Significance. By I. MACFARLANE SMITH. University of London, 1964. Pp. 408. Price 35s.

The Sixth Conference on Human Relations in Industry. By THE SOUTH INDIA TEXTILE RESEARCH ASSOCIATION. Coimbatore: S.I.T.R.A., 1964. Pp. 129. Price $4.00.

The Abnormal Person and His World: An Introduction to Psychopathology. By PAUL J. STERN. New Jersey: D. Van Nostrand, 1964. Pp. xi+239. Price 40s.

The Advertising Man in London Advertising Agencies. By J. TUNSTALL. London: Chapman and Hall, 1964. Pp. 288. Price 30s.

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Work and Motivation. By VICTOR H. VROOM. New York: John Wiley, 1964. Pp. ix+331. Price 53s.

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Casebook on Interpersonal Behavior in Organizations. By A. ZALEZNIK and D. MOMENT. New York: John Wiley, 1964. Pp. xvi+587. Price 60s.

The Dynamics of Interpersonal Behavior. By ABRAHAM ZALEZNIK and D. MOMENT. New York: John Wiley, 1964. Pp. ix+520. Price 60s.

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The Criterion Problem in Selection and Guidance*

1.—By ALEC RODGER

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IN *The Prediction of Performance in Clinical Psychology*, Kelly & Fiske (1951) remarked: "The two decades between 1920 and 1940 will probably be looked back upon as the time when psychologists were concerned with the development of predictor measures . . . The decade or two after 1940 will probably be looked upon as the era of the criterion problem." They themselves, and many others, including Cronbach (1949), Super (1949), R. L. Thorndike (1949) and Vernon & Parry (1949), had already begun to make this true.

However, I am sure all these writers would agree that the criterion problem had never been wholly neglected. In 1932 Viteles had presented, in his characteristically systematic and comprehensive way, a list of a dozen commonly used criteria of the so-called 'objective' kind, and he had outlined several ways of collecting 'subjective' assessments. The main trouble had been — as indeed Bingham had pointed out even earlier, in 1926 — that too many investigators had been inclined to search around for criteria at the end of their studies instead of thinking about them at the beginning. They had formulated and used their procedures for guidance, selection, training and other purposes, and *then* they had sought criteria by which to judge the success of their work.

Of course, this kind of thing still goes on. We cannot be surprised that it does so. Take any twelve introductory texts on general psychology and look up the word 'criterion' in the index of each. The chances are that, if you find it there at all, it will refer you to one or two pages towards the end of the book, where a passing perfunctory nod is given towards tests of one sort and another. The statements made will almost certainly turn out to be sketchy and perhaps even misleading. Is it to be expected that the postgraduate student of psychology will arrive on our doorsteps with a really informed appreciation of 'the criterion problem' in selection, guidance or anything else? I think not.

But although we have far to go, we have come a long way already. Perhaps World War II had a big part to play in our advance. Many of us *had* to propose criteria whereby the value of our work could be judged by those who employed us. We should not have lasted long in our war-time jobs, if we had failed to do this. Our criteria may have been primitive in many cases (for example, a pass or fail criterion based on a possibly useless examination); but perhaps they were on the whole sound, convenient and acceptable to our users.

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*A contribution to a Symposium held at the Fifteenth International Congress of Applied Psychology in Ljubljana, Jugo-Slavia, in August, 1964.

If Kelly & Fiske were justified in regarding the 20 years up to 1940 as the era of predictors, and the next 20 years after that as the era of criteria, perhaps we might regard the next 20 (from 1961 to 1980) as potentially the era of *refined* criteria. Certainly we are due, in the fields of selection and guidance, for a little more sophistication. (I hasten to add that I am not talking about statistical refinements in ways of relating criteria to predictors. In this matter I agree with Guion's (1961) warning that this provides no solution to the criterion problem itself. You may recall that he quotes approvingly Wherry's (1957) earlier description of the attitude of many people: "We don't know what we are doing, but we are doing it very carefully and hope you are pleased with our unintelligent diligence.")

I want to suggest today that in the last five years we have in fact entered on a period of sophistication. Nothing displays this more strikingly than the rapprochement between guidance and selection. From Super and his colleagues on the guidance side we have heard a good deal about vocational development. From many on the selection side we have heard a good deal about management development. It is perhaps no accident that the idea of 'development' features prominently in both fields.

It is still true, perhaps, that in guidance the broad objective is the *satisfaction* of the individual, and that in selection the broad objective is his *satisfactoriness* to his employer (Rodger & Cavanagh, 1962b). I think it could be argued that one of the fruits of full employment in some parts of the world has been increased recognition of the importance of both satisfaction and satisfactoriness. However this may be, it is probably true that employers in many places, at many times, have learned that a competent worker is not necessarily a contented worker who will be ready to go on and on. We are, however, beginning to examine more closely what we mean by such words as satisfaction and satisfactoriness (Carlson *et al.*, 1962, 1963); and one consequence seems to be that, in some areas at least, guidance and selection are drawing closer together. This will be evident, I think, in the papers of Max Brolly and Albert Thompson; and I have no doubt that Philip Vernon too will have something to say about it.

In this opening contribution I want to draw attention to four trends. The first is towards discontent with the way in which the distinction between 'objective' and 'subjective' criteria is often made. The discontent is not new, of course. There always have been psychologists who have held that a manifestly subjective assessment does not become objective merely through its expression in figures instead of words. A foreman's opinion that Mr A is a better worker than Mr B does not lose its subjectivity when he decides to give Mr A five points and Mr B three. But our discontent with this kind of thing is, I suspect, breaking out again. We are, very properly, becoming exasperated by superficiality. Nor is the superficiality to be found only in the occupational field. Can we not see it in the fields of mental health and delinquency? How often do we find that subjective assessments made by doctors and lawyers have become the basis for spuriously 'objective' assessments, because they have led to decisions about disposal?

Let me make it clear that I am not here criticising the use of subjective judgments. Indeed, as you will see in a moment, I think that the need for recognising the inevitability of subjective judgment in much of our work is very great. What I am worried about is our failure to see that allegedly objective judgments are often basically subjective.

The second trend I discern is related to the first. It is an increasing realisation that our criteria vary in importance from time to time and place to place. Ghiselli & Mason Haire, in their 1960 paper on taxicab drivers, spoke of the 'dynamic' character of criteria. They were concerned, you may remember, with the prediction of what they called 'rate of improvement.' This is important, but it is not what I have in mind here. My point is that a criterion which is important at one time, or in one place, may become considerably less important in changed circumstances. In the guidance field, we know very well that the young man in his twenties, who has not previously given much thought to his domestic future, may change radically his ideas about his work when he decides to marry and start a family. Our basis for judging his success must surely change too. In the selection field, we sometimes seem less willing to realise that a change in the state of the labour market, or in an employer's targets, may make nonsense of the criteria we have been using so far.

For example, a drop in labour turnover, which may have been an important objective of a manufacturing firm, may become unimportant as a criterion in its selection of operatives, if that firm changes its production methods; or if it finds that, by deciding to give part-time employment to married women, it has now no cause for anxiety. Again, if trade is slack but is almost certain to pick up in a few months, and the company is eager to hang on to its present labour force, sickness absence may seem quite unimportant. In fact, it may be regarded as a welcome protection against greater dangers. Also, reduction in the wastage of material beyond a certain point may itself be wasteful, because raw materials may currently be cheap, or customers may be willing to foot the bill. In my innocence, I once made an unsolicited study of the laborious and time-consuming way in which sailors cleaned up the quarter deck of a cruiser. Some days later I presented the captain with a proposal for a new method. My reward was a vast smile of amusement. His problem was to keep his men occupied when the enemy were not in sight: the longer their cleaning jobs took them, the happier he was.

The implication seems clear. In certain of our fields of activity — selection is undoubtedly one of them, and training is another — our choice of criteria must be made with an ear to the ground. Perhaps, in industry, it should be made with an ear to the boardroom keyhole. Perhaps we should not make the choice ourselves at all. What we need, presumably, are criteria which are currently regarded as important by those who are concerned with the use of the company's money. If we choose criteria which they think have little or no relevance to their financial problem, we may be regarded as long-haired dreamers; and we may deserve our fate. I suspect that this second trend towards greater realism stems partly from the fact that the psychologist's knowledge of industry — and industrialists — is perhaps much greater than it used to be.

The third trend I discern is related to the first and the second. It seems to me that we are, rightly, paying more attention to 'expectations' in our choice of criteria. Those of us who have done a fair amount of adult vocational guidance know very well that a large part of our task consists in helping an individual to 'come to terms' with himself. If I might use our Birkbeck 'fitting the man to the job' and 'fitting the job to the man' scheme (Rodger & Cavanagh, 1962a) another way, I would say that in guidance we are concerned with 'fitting the man to his own expectations' and 'fitting his own expectations to the man.' In selection, we are perhaps becoming more concerned than we were with the employer's expectations.

One of our students, Lake (1963), in a recent follow-up study of 55 men appointed to works management or sales management posts, used the question: "Has he exceeded your expectations, or come up to them, or fallen short of them?" Using also criterion measures based on continued employment, pay increases and promotion, he found that the 'expectations' criterion appeared to be the one most commonly used in evaluating job performance; and indeed he concluded that decisions to retain a man, increase his pay or promote him depended largely on the extent to which he came up to his employer's expectations.

Here, you may say, we have as feeble a criterion as anything could be. It is true that it raises a substantial cluster of problems. Whose expectations are we talking about? Were his expectations when he appointed the man the same expectations that he used in judging him several years later? Were they reasonable expectations? If the expectations were unfulfilled, was the man who said so aware of all the circumstances relevant to his final judgment?

We can and should raise all these queries. But if, as Lake suggests, it was the employer's expectations that guided him to his decisions about a manager's continued employment, his pay increases and his promotion, they become for us criteria of operational importance, because they lead to administrative action. It may be argued that in the last resort nearly all such decisions — commonly made the basis for allegedly objective criteria — are based on a rough subjective comparison between a man's perceived performance and a current distortion of a vaguely remembered expectation. Nevertheless, if these things are used to determine a man's future, we must surely take account of them.

Now I come to my fourth and last trend. Perhaps the wish is being father to the thought here. It is possible that what I mean is that I would like to see more signs of a fourth trend which would help us to solve the problems raised by the first three. However, I think it is reasonably true to say that in a renewed interest in job analysis, conducted intelligently, we have a hopeful sign. I spoke briefly about this at the Rome Congress (Rodger, 1958), and I do not propose to expound here our Birkbeck ideas on the importance of studying occupational 'difficulties and distastes.' They sprang, after an exceptionally long period of gestation, from some work done 30 years ago on the selection of airport management trainees (which was not even reported until 1945); and it has been applied since then to occupations of several kinds and levels, including industrial consultancy. It has affinities with Flanagan's (1949, 1954) 'critical incident' approach, but perhaps it takes more account of the worker's own experience, and certainly it involves readiness to generalise at an earlier stage. (The United Kingdom is rather smaller than the United States of America, and very often we tend to have fewer cases. This, we think, gives us a slightly better excuse for leaping to conclusions.)

Let me finish with a brief illustration of what I mean by 'job analysis, conducted intelligently'. A short time ago, in helping a large-circulation newspaper with its management development programme, I suggested that we should look critically at some of their job specifications, including one prepared for their head printer, who would shortly retire. Discussion with the head printer himself, on the 'difficulties and distates' of his job, was introduced by the broad question: "Is there anything you will be really glad to be away from, when you retire at the end of the year?" His reply was prompt and firm: "The editorial department, and my compositors." Although our discussion lasted nearly two hours, most of it concerned these two things.

The point was, although the job specification indicated plainly that one of his several tasks was '*to liaise*' with the editorial department and that another was to supervise the work of the compositors, it gave no hint whatever that these two were crucial. Here he was, the head printer of one of the world's best-known daily newspapers, faced six nights a week with a situation which many men would not want to face at all. His job was to turn into print, after scrutiny by the newspaper's legal advisers, the 'copy' written by the journalists. He had to do this in time for the vans in the basement to rush the newspapers away, soon after midnight, to the trains and the planes. The journalists, not unnaturally, wanted to be as late as possible with their copy, so that they could be up-to-the-minute, for that is how journalists 'get on.' They had their time-schedules, of course; but, it seemed, they did not keep to them. Their 'victim' said to me: "You can judge how important this point is to me, when I tell you that, in the 17 years I have been head printer on this paper, these editorial boys have been up to time on two nights." The problem presented by the compositors was consequential. As the newspaper is a tabloid, with what he called a 'jazzy' set-up — thick rules, thin rules, straight rules, wavy rules, and types of various sorts and sizes — his men are paid on a kind of piece-rate. He has to price their work, and he has to do it promptly and to their satisfaction. If he were to fail, tomorrow's paper might not appear at all, for the union is exceedingly powerful. And all the time he is aware that the vans down in the basement are waiting. He is aware, also, that the trains and the planes at the other end will *not* wait.

To cut a long story short: For seventeen years this man had lived through a nightly crisis. His future — and the future of others — was staked on his competence and willingness in coping with these basic features of his job, with their attendant difficulties and distastes. But all the job specification had to say about them was contained in a brief, colourless, conventional description — to liaise, and to supervise. I suggest that, whenever it can be done, we should reduce our criterion problems by remembering that our most important criterion is usually the performance of a task that has been described clearly, comprehensively and with emphasis on the difficulties and distastes commonly experienced by those who undertake it.

I say that this might well be our aim 'whenever it can be done,' because I am well aware that in many circumstances, not only in guidance but also in selection, it is an aim which seems impossible of achievement. But perhaps Max Brolly and Albert Thompson will prove to be less pessimistic about this than I am.

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The Criterion Problem in Selection and Guidance*

2.—By ALBERT S. THOMPSON

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NATURE AND CHARACTERISTICS OF CRITERIA

RESEARCH in the area of selection and vocational guidance during the past decade has been increasingly concerned with the 'criterion problem', i.e., the measure of the performance or the behavior which is to be predicted. Despite the refinements of measurement of a wide variety of psychological characteristics, the validity co-efficients in most of our prediction studies rarely get higher than .60 and then only under very special circumstances. The current belief is that further improvement in prediction will more likely come through improvement in the criterion than in the predictors. When the criterion measure is gross and includes irrelevant factors, refinement of the prediction variables is hindered.

In theory, a good criterion is one which is reliable, differentiating, practical, and relevant. Of greatest importance is the requirement of relevance, since relevance is related to the outcome of the performance being predicted. It is obviously of little value to be able to predict accurately some aspect of the total performance which is relatively unimportant or of little practical value.

We must then ask the question "How relevant is the criterion to the objectives of the situation?" In *selection*, the objective is to develop a work force of high productivity and satisfaction. The objective of *vocational guidance* is to help the individual develop and carry out a vocational plan which will be personally satisfying and socially useful. The *vocational goal of the individual* is to have a satisfying career, i.e., a sequence of positions which provides an outlet for his developing needs and an opportunity to implement his self-concept. From this point of view it is rather obvious that most of the criteria used in prediction studies leave much to be desired when matched against the overall objectives of the situation, particularly when the research is in the area of vocational guidance. There is a wide gap between the above definition of the vocational goal of the individual and the usual criteria of salary, superior's ratings, level of position, etc.

STATIC VERSUS DYNAMIC CRITERIA

The 'will-of-the-wisp' unrealistic goal of early researchers in the field, and even now, has been to discover a highly accurate predictor of some ideal criterion. The unrealistic expectation is that somewhere there is a magic set of predictors so powerful that they will determine the ultimate performance of the individual regardless of extraneous circumstances, chance events, and the attempts by the individual and society to defeat the prediction. Obviously, such an ideal situation is unattainable.

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*A contribution to a Symposium held at the Fifteenth International Congress of Applied Psychology in Ljubljana, Jugo-Slavia, in August, 1964.

But the goal has been attractive and researchers have done much to attempt to arrive at this goal. For example, there has been the expansion of the criterion from a relatively simple dimension, such as salary or supervisor's ratings or production figures, to a much more complex criterion involving combining several variables into some sort of multiple criterion. This has been useful and has helped us to realize that there is no simple, single, ideal criterion in real life.

It is becoming increasingly recognized, however, that the basic weakness of past criteria has been their static nature, resulting from the attempt to measure an individual's performance at some moment of time. This is in line with the usual paradigm of validation research, in which one measurement taken at a given time (the predictor) is correlated with another measurement at a later time (the criterion). But in real life we are dealing with a changing individual and a changing situation rather than with two static sets of data.

A clear statement of the dynamic dimensions of criteria was made by Ghiselli (1956) when he pointed out that the dimensions along which performance should be judged change as a result of experience. What is most relevant at one stage may fade into unimportance while some other dimension takes its place. Ghiselli and Haire (1960), for example, found that one set of tests was able to predict performance of cab drivers during the first three weeks of their performance but that another set of tests was necessary to predict their differential performance at a later period of their service. Likewise Guion (1961) found that first-year sales and sales after five years of service were not equivalent criteria and that predictors of early success were different from those of later success. From these findings it is necessary to conclude that an adequate criterion must be multi-dimensional and must reflect the changing importance of performance variables.

Even with this recognition of the changing nature of the criterion at different stages in the work history of the individual on the job, the orientation is still the predicting of performance at a given time and on a given job. But particularly in vocational guidance, where the goal is a satisfactory career for the individual rather than performance on a single job, the need is for a measure based on total work history rather than performance at a given time. The questions to be answered by the criterion have a somewhat different flavor. Here we are concerned with not "How well is he doing?" but "At what stage in his career development is he?" Here we are concerned not primarily with comparing the individual's performance with others on similar jobs but rather with how the individual is doing compared with his own expectations or with a projected plan representing his vocational goals. We are therefore, in asking these questions, shifting from what Super (1963) has called the occupational model to the career model in looking at and evaluating the performance of the individual.

CAREER VERSUS OCCUPATION CRITERIA

In the *occupational* model we are concerned with success in an occupation. The procedure is basically one of identifying the position currently held by the individual, classifying this position in some occupational group on the basis of its responsibilities and tasks, and then evaluating the individual's performance with respect to the occupational demands or the performance of his peers or against some other frame of reference.

A *career* on the other hand, is characterized by a sequence of positions in the life of an individual. It is characterized by movement (or lack of it) in various directions, i.e., vertically up or down some hierarchy within a field of work or an organization, or horizontally, that is movement to and from positions in related or even unrelated fields but at the same general level.

This pattern of movement through the 'world of work' is the fundamental characteristic of one's career. If one uses a three-dimensional representation of the world of work based on the three dimensions of field of activity, level of position, and enterprise (type of employing agency) one can use the analogy of an organism working his way through a cube with the path taken by the individual within this cube representing his 'career pattern.' Or if one prefers a two-dimensional representation of field and level, one can visualize a lattice over which the individual moves in different directions and at different rates.

The criterion problem therefore is one of getting a measure of this "pattern of movement' represented by the sequence of positions held by the individual and of determining the adequacy of the individual's vocational behaviour in coping with the developmental tasks of the stage of the career of the individual.

Several attempts have been made to identify the important dimensions or ways in which career patterns differ. One can describe career patterns from a primarily descriptive point of view namely the direction and the rate of movement. Here, as Thorndike and Hagen (1959) did in their study of the careers of ten thousand Air Force officers, measures can be obtained of Vertical Mobility, Lateral Mobility, Income, Time on the Job, etc. These criteria describe ways in which people differ in working through their careers.

Another approach is to obtain a measure of the degree of vocational development of the individual, as represented by his career up to the point of study. This approach underlies the concept of 'vocational maturity' in which one sets up a series of stages through which individuals go in their careers and then describes the individual in terms of his progress through these stages. Or one may think of the concept of 'vocational age' and then determine whether the individual in question is normal, retarded, or advanced with respect to his expected vocational development. At least in theory, one could end up with a Vocational Quotient.

An example of the development of career criteria is seen in the work of Super's Career Pattern Study, in which a group of boys approximately 14 years of age were intensively studied in 1952 and have subsequently been followed up in their educational and work histories. It has been found, for example, that the vocational development tasks in the adolescent and early adult periods can be classified as exploratory and establishment (Super, 1960). The empirical question is how young people behave vocationally in dealing with these tasks. In a recent formulation five ways of behaving during these exploratory and establishment periods have been identified: floundering, trial, stagnation, instrumentation, and establishment. Both floundering and trial are represented by movements from one job to another, but whether the movement is appropriately classified as floundering or trial depends upon (1) the contribution of the movement toward the vocational goal or (2) the meaning of the job changes to the individual making them, or (3) whether the movement is to a job which is better or more poorly suited to the psychological characteristics of the individual than is the vacated job. Stagnation, on the other hand, is remaining on a job or in an occupation longer than is good for the individual concerned. Here again both external and internal criteria are important.

Instrumental vocational behaviour is characterized by its goal-directedness. It is instrumental when the individual sees the relationship of the behaviour to the goal he is trying for so that what may appear to be floundering may actually turn out to be instrumental if one sufficiently understands the goal and the plans of the individual.

An interesting example of this is found in a recent study by the National Science Foundation (1963) of 40,000 college graduates of 1958 with whom contact was made two years later in an attempt to learn something about their post-college careers. The finding from this study which is relevant to this discussion is that about a third of the group indicated that the job held two years subsequent to graduation was one in which their college degree was *not* a necessary background for the job. One might conclude from this that there was a poor matching of the college work with the job and therefore this large group was 'vocationally misplaced.' However, when asked why they were not in a field relevant to their college preparation, about one fifth reported that the job was really a way to break into a desired field of specialization. This was particularly true of those going on for further graduate work who were holding down temporary jobs in order to arrive at their goal. This was being done deliberately and as part of a plan. The important point here is that the objective relationship between job after two years and college preparation can be interpreted only when subjective data concerning the intentions of the individual are added to the total picture.

Another attempt to develop a measure of vocational maturity is seen in the Vocational Development Project being carried out at the University of Iowa (Crites, 1964). To provide a standardized test of vocational maturity, a Vocational Development Inventory was constructed, consisting of two parts, the Competence Test and the Concept Test, designed to assess the aptitude and attitude dimensions of vocational development. The sub-sections of the test are designed to measure such vocational development variables as choice factors, independence of behaviour, active-passive involvement, means-end cognizance (that is, the tendency of an individual to think about the means necessary to obtain the desired end), time projection, optimum use of day dream and fantasy, self knowledge, job knowledge and ability to relate knowledge of self and work. Through application of the inventory to differing age groups and in planned longitudinal studies, the reliability and validity of the Vocational Development Inventory will be determined. In particular, it will be important to determine the relationship of the Inventory responses to vocational behaviors known to change with age.

CONCLUDING COMMENTS

Although most of the examples so far have been taken from the field of vocational guidance, there are signs that interest in the career model rather than the occupational model is developing in situations characterized by selection rather than guidance. For example, Ghiselli (1963) in a recent summary of studies of managerial talent writes: "In talking about managerial success we should not just consider an individual's performance on a single job but rather his progress through a series of positions, in other words, his career as a manager." Dill, Hilton & Reitman (1962), on the basis of their follow-up study of engineering school graduates, conclude that an adequate theory of management development needs to be process-oriented. "It should reflect managerial progress for what it is — a sequence of short-term interactions between young men (with goals, skills, ways of looking at the world, and ways of acting and learning) and their environments (which as persons or systems provide opportunities to act, information about the consequences of action, and judgements about performance)." In the Bell Telephone System of the United States, for example, a Management Progress Study was initiated in 1956 in which a group of over four hundred men are being studied on a longitudinal basis, beginning with an extensive assessment process in 1956 and continuing with periodic interviews and examinations as well as detailed histories of their experience. It is being done entirely for research purposes, with no feedback either to the individuals or the company and therefore has minimal criterion contamination. Another long term study is that of the Standard Oil Company of New Jersey (1961) in their research entitled, "Early Identification of Management Potential" in which long term predictions are being made of the managerial behaviour of employees examined early in their work histories. In recognition of the dynamic nature of criteria, a complex salary criterion was developed based on an index reflecting the individual's salary achievement relative to his peers and on the movement of that index during the individual's history with the company.

It is apparent that the amount of reported research using the concept of the career model is still relatively small. A look at the field in the mid-1960s would suggest that we are still at the stage of (1) recognition of the importance of the problem (2) formulation of some of the basic concepts (3) identification of some of the basic dimensions which need to be measured and studied but (4) relatively little data from which vocational development stages scales can be derived and *Career Progress Quotients* can be computed. Here is a challenge for the future.

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The Criterion Problem in Selection and Guidance*

3.—By M. H. BROLLY

British-American Tobacco Company, London

ABOUT 17 years ago my company brought up to date its selection methods. In doing so it followed quite closely procedures which had been developed in the Armed Forces during the war. In those 17 years we have made no attempt to validate the selection. In the main this negative attitude follows the belief that such an attempt would be fruitless. Our selection is done in blind faith and hope. We accept that the methods used have been of value in other circumstances in finding the better men and rejecting the poorer men. We accept that these methods have been successful in selecting, say, officer candidates in the Services. We select the same kind of men and we hope that such men will prove more valuable in industry than those we have rejected.

Perhaps I make it appear that we have had clear and strong convictions on this subject. This is not the case. To begin with we hoped to justify what we were doing, but circumstances have been against us. At first we were recruiting to meet a shortage that had developed through scarcity of man power during the war. Much of our business is in less well developed countries and management staff were largely British. They were recruited and selected in London for employment in any one of 50 different countries. In a peak year I believe we considered as many as 5,000 candidates and recruited about 100 of them. It was all too easy to postpone research until the pressure reduced and there was opportunity to assess the success or otherwise of our recruits.

Two things, in the main, have since made the task appear less worth while. First, by the time the pressure of recruiting work began to ease off we could already see a major change ahead of us. The emergence of the under-developed countries; the rapid build up of education; the rush of young men to train in and adopt to a considerable degree the culture of more industrialised countries meant that much of our selection for management has been decentralized. The Company in Kenya or Costa Rica, in Singapore or Ceylon, expects (and some times experiences considerable political pressure) to find its management trainee locally. Only about 5% of our current recruits are British. With the prospect of this loss of control and loss of central standards there was little encouragement to prove the value of a system that was passing. Even if we could validate what we had done we would still have to guess whether we could do the same in Timbuctoo as in London and with the same results.

But the second factor was even more discouraging. The more we examined the problem — 'examined' only in a very broad sense — the more we were forced to admit that we did not know what kind of man made a good manager. We had no method of assessing how good a manager he was. We did not know what we were looking for. And we did not know whether we were finding it. Obviously some of our managers are judged and believed to be better than others but we have no quantitative measure to support this. I would go further than this and say we do not even know what our managers do. We know that the manufacturers manufacture and the salesmen sell and the general managers manage. We may even state their specific responsibilities. But what we say they should do and what we know of their behaviour in meeting our requirements only touches the fringe of the problem of measuring their performance. We do not know how much of their time is spent in discussing problems, making decisions, developing staff, fostering public relations, etc., as opposed to the trivia of day to day routine; nor do we have any means of measuring their effectiveness in any of these fields.

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*A contribution to a Symposium held at the Fifteenth International Congress of Applied Psychology in Ljubljana, Jugo-Slavia, in August, 1964.

Nor has there been much research elsewhere into this unknown territory. I think the most ambitious study since the war of top managers — and these are the people of most importance to us — was made by Sune Carlson (1951) in Sweden; and that was limited to the analysis of the work of 9 managing directors and how they spent their time for 4 weeks. It seems likely too that there are national differences. For example Carlson found that his Swedish managers wrote very few letters — only 2 or 3 a week and the maximum was 2 or 3 a day. But he quotes a study of 12 German executives who spent an average of 2 hours a day dictating and 30 minutes a day signing letters.

Even if we knew what our managers did how would we measure their performance. A study by Shearer of the Industrial Relations Section of Princeton University of high level manpower in oversea subsidiaries concentrated much of its attention on the relative effectiveness of expatriate and national management. This is a vital matter to us since the employment of expatriate managers is in many ways an expensive and inefficient arrangement. No evidence was found of any quantitative measure which would distinguish among the managers concerned. Standard Oil have developed tests for the Early Identification of Management Potential and claim a correlation of 0.70 with what is described as a carefully developed measure of managerial success. But I still have to be convinced that such measurement is both realistic and possible.

You might think that my company would be in a better position than most to study, say, factory managers since we have upwards of 100 factories making cigarettes. Although a few are very small and a few are very large the majority are closely comparable both in size and process. But this is not enough. One factory manager will have an aggressive and unco-operative labour force and another will have the opposite; and this difference will result much more from the political and trade union atmosphere of the country than from the behaviour of the factory manager. Even successive managers in the same factory cannot be compared since the changes in political atmosphere produce changes in the attitude of labour which generally swamp (for measurement purposes) any change the new manager could effect. Profitability is affected by fiscal changes, the restriction or not of imports, the existence of competition or not and in some places the need, for anti-monopolistic reasons, to limit our share of the total market. Everywhere we look we find that the factor we might measure is affected to a major degree by things outside the manager's control. Variation in the manager's performance is masked by our inability to be precise in the assessments of larger variation in the proportion of change attributable or not to the manager. It is like trying to find the difference in weight between a £1 note and a ten shilling note by weighing identical trucks, one of which carries a £1 note and the other a ten shilling note. The fact that one is twice as valuable as the other is not readily discernible. The manufacturer of the two trucks may tell us that these trucks are identical but we have reservations. Should we expand our effort in trying to develop a weighing machine sufficiently accurate to distinguish between truck plus £1 note and truck plus ten shilling note? On the whole we think not and so we continue to select men in blind faith and hope without making any real attempt to validate our performance or to find the criteria we need.

This may sound like a policy of despair but there are compensatory factors. First, if some of you feel I am confessing to a ridiculous situation I might add that at least we have not gone bankrupt in the process. In spite of losing around 50 per cent of our assets with the change of government and ideology in China, we have recovered to the point of earning about US $200,000,000 in profit per annum.

Second, we have not given up hope but we propose to tackle the problem in roundabout fashion. We do not feel justified in trying to refine our selection process. But we do feel that there is still enormous scope for the development of managerial ability among the men we recruit — that much greater development is possible than we have achieved in the past. Briefly we hope to stress the importance of self-development. We hope to persuade every manager that he and his subordinate should devote considerable time to the subordinate's job. How can the subordinate's job be improved, re-structured, made easier, made more effective. We hope that this can come from the subordinate; and that as the subordinate re-shapes his job and grasps added responsibility he will see, too, the need to encourage *his* subordinate in the same way. We hope to find some way of assessing the realism and enthusiasm with which the subordinate sets himself a new target; of assessing the speed and manner with which he achieves it. More correctly we hope that the subordinate himself will find the means of assessment. We are beginning to believe that the subordinate can develop himself better than his senior can. We hope that he may also be better able to assess himself than can his senior. There is some anecdotal evidence that when the subordinate is given support and encouragement to take a hand in the design of his own job he can achieve both great progress and considerable accuracy in estimating his own progress. I spoke of the difficulty of measuring the difference in value between a £1 and ten shilling note by weighing them. These notes, after all, can themselves tell us their difference in value — by colour and printing. Perhaps our managers could also tell us what they themselves are worth.

So, although we do not believe that it is possible to validate our selection methods, we have not given up hope.

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The Criterion Problem in Selection and Guidance*

4.—By P. E. VERNON

Institute of Education, University of London

IN my contribution to this symposium I intend to argue first that a good deal of progress has been made in various directions; secondly, that we need to consider the criterion problem in a much broader way than merely as a matter of connecting predictions with follow-up data. I wish particularly to refer here to the work of L. J. Cronbach which, it seems to me, has thrown fresh light on the whole area of validation. Thirdly, I am interested in multiple criteria and in ways of reaching them and combining them — e.g., by the application of factor analysis. And, fourthly, I wish to suggest that vocational psychologists can learn something about criteria and the evaluation of their methods from recent developments in clinical psychology, such as the work of Carl Rogers.

My first point is that progress has been made. Though as an educational psychologist I would naturally have to admit that vocational criteria are seldom as straightforward or as satisfactory as criteria of educational achievement, yet I am not quite so pessimistic as Mr Brolly. True, we can seldom get a single satisfactory one, complete in itself, and have to make do with a variety of indirect and partial criteria, but such situations as Mr Brolly describes, where the psychologist is badly stumped, are relatively rare. I am emboldened too by the fact that vocational psychologists have built up a lot of valuable expertise; they are far more aware of the snags in the commonly used criteria than are the layman or the general psychologist, and they have arrived at a number of principles and techniques for reducing, if not for overcoming, these weaknesses. It might be too much to claim that there is an established science of setting up and using criteria; indeed there is probably a considerable amount of art and subjective judgment in thinking up useful measurable outcomes of our procedures, and in weighing up the varied results that they yield. But at least it is a speciality, where there is much to be learnt from the skilful manipulations and interpretations of experienced practitioners.

The main principles were, I think, first formulated effectively by Clark Hull in his book *Aptitude Testing*, as far back as 1928, and he has been very largely followed in many subsequent textbooks. This is a little unfortunate since he makes validation appear to be too straightforward a matter of correlating tests and other selective procedures with some measure of achievement — either objective records or output, examination results and the like, or some form of merit rating. In fact, of course, vocational psychologists such as Viteles in America, Macrae, Rodger and others in England, were soon using a far more flexible approach to validation and there was a bitter quarrel in the 1930s between E. L.

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Thorndike who insisted that vocational guidance was useless because tests failed to correlate with later occupational success and Macrae who regarded these findings as irrelevant to the actual job of the counselor. I will refrain from discussing the innumerable difficulties involved in getting adequate objective or subjective measures of proficiency, but I will mention a few of the alternative kinds of criteria which were employed around this period; salary or promotion achieved, fewness of job changes and reduction in labour turnover, gradual drift in a counseled population towards jobs recommended by the psychologist, reduction of electricity consumption and of accidents in a tramway system, frequency of psychiatric breakdown and award of combat medals among air force personnel, self-ratings of satisfaction with career and so on. These and innumerable other group differences, which can seldom be expressed in accordance with the classical model, in terms of linear correlations, have not only helped to show the psychologist that he is working along sound lines, but have also fulfilled the important function of convincing employers and other users of the value of the psychologist's services. Long before the American Psychological Association formulated the principles of construct validation, vocational psychologists were applying them. At the same time we should recognise that this approach suffers from the same weakness as does modern construct validation, that the various lines of positive though indirect evidence of validity seldom tell one how much invalidity is still present. It is only too easy to obtain small but significant group differences in the hypothesized direction and to jump to the conclusion that this provides complete validation for all one's theories and methods. Even if we take such a striking difference as that often reported by the National Institute of Industrial Psychology, namely 90 per cent of those following the psychologists' recommendations satisfied with their career versus 50 per cent or so of those who go against the recommendation — how is it that as many as 50 per cent seem to contradict the psychologist's diagnosis? If we could express this difference as a correlation I doubt if it would exceed a coefficient of 0.5.

When I myself became directly concerned with selection problems from 1941-47, I was struck by yet another aspect of the complexity of the problem which had barely been hinted at by Clark Hull and earlier writers — namely the fact that the situation is statistically quite different, depending on the proportion of candidates to be selected and the proportion adjudged suitable. For example, the so-called wastage rate among recruits allocated to a given trade turned out to be quite a meaningless figure until it was related to the selection ratio or base rate. This also meant, in effect, that in any selection or counselling situation a value judgment must be made as to whether the interests of the client or the employer are paramount, and whether it is more undesirable to select doubtfully suitable candidates or to reject doubtfully unsuitable ones. The kind of criteria to be employed will also depend then on the different circumstances. These ideas were further developed by McClelland in Scotland and after the war, by Arbous in South Africa.

In our work during the war period we were, I suppose, groping towards the kind of conception which was much more fully and brilliantly formulated by Cronbach and Gleser in their book in 1957, *Psychological Tests and Personnel Decisions*. They pointed out that the total effect or pay-off of the vocational psychologist's procedures must be considered much more broadly than just in terms of correlations between predictors and criteria or reductions in wastage of inappropriately placed candidates. For example, during World War II, the British Army psychologists and psychiatrists pioneered a method of selection of officer candidates based largely on observation of situational or leaderless group tests — which is still in use and which has been extended to the selection of business executives, ministers, teachers, youth leaders and even secondary school pupils.

Immense efforts were expended in collecting criterion ratings, not only of the training results but also of the combat efficiency of accepted officer cadets, and correlating them with the judgments of the War Office Selection Boards. The results were always positive, but, at best, the overall validity coefficients reached 0.3 to 0.4 and were often weaker than this. However, taking the broader view we were able to show that senior Army officers were generally satisfied with the products of the new selection boards and were impressed by the board's procedures as fair and searching. Obviously such expressions of satisfaction were hopelessly subjective and inadequate as psychometric criteria, but they nevertheless constituted a useful pay-off. Had the situation been reversed — had the selection procedure shown excellent statistical validity but senior officers had been suspicious and distrustful of the qualifications of their newly trained officers — the British Army would have been in a sorry plight. A good deal more convincing was the fact that, prior to the establishment of the boards, sufficient candidates for commissions were not forthcoming, the recruits were so distrustful of the old system of recommendation by their units and an interview with one or two generals, whereas after their introduction recruits realised that they would be seriously studied and not selected or rejected on grounds of social class, participation in athletics or smart manner — and the flow of candidates increased tremendously. In other words the socio-psychotherapeutic effect of the new boards was highly favourable and more than compensated for doubts about the conventional validity of the technique as such.

Professor Cronbach, of course, has done much more than merely point out the complexity of validational problems; he has gone some way to providing mathematical models to represent the interaction of many of the relevant factors. Unfortunately his work is still mainly at the theoretical level; I have not come across attempts to apply it to practical problems, though that may be merely my ignorance. More influential, perhaps, has been his demonstration that sequential, step-by-step selection and guidance is likely to be more effective than a single, once-for-all, operation; also that it may be more profitable to modify the training or subsequent treatment of the persons recruited to some job than to concentrate on choosing the best possible candidates in the first place. To take Army officers again as an example: if we pick only those candidates who obtain the highest assessments on the tests or other procedures that are known to possess positive validity, we will be in danger of denuding the Army of many men who would make much better radio mechanics, interpreters, accountants and non-commissioned officers, while also rejecting numerous candidates who, with adequate training, would make as good or better officers. It may, of course, be far more difficult to extend these principles to the immensely variegated jungle of the business world in which Mr Brolly works than to such circumscribed systems as the Services or schools, where large numbers of people are carrying out one of a series of well-defined jobs. But I would hope that we might try.

In this connection, I would like to comment briefly on the question of immediate, intermediate and long-term criteria. I tend to support making the maximum use of immediate criteria although this contradicts the need that I have emphasized to take account of the total psychological situation. Two obvious reasons for this are, first, that we often cannot wait to find out if our procedures are working well, and, second, that clients who do not satisfy the immediate criterion are so often dismissed from the career. Recently I had the opportunity to follow up the careers of a considerable group of officers in one of the Services over 15 years, including assessments at the time of selection, marks on training courses, and commanding officers' reports every two or three years. There was virtually no correlation between the earlier assessments and the final ones until the officers had been commissioned for over a year; in other words not only the psychological tests but also the training unit assessments and the first stages as a serving officer showed negligible validity. But note that even if we had found tests or other procedures which correlated with mature proficiency, there would have been little point in using them, since we would merely have increased the failure rate in the training school. In another research by a Ph.D. student it was shown that achievement of good science degrees at Cambridge University did not correlate appreciably with subsequent attainment of Fellowship of the Royal Society. Such results make me wonder whether we have not somehow created an artificial, insoluble problem for ourselves by analysing the situation in terms of immediate and later criteria and that a new approach along the lines that Cronbach has introduced might lead, in Gestalt terminology, to a complete restructuring of the field.

I said that, thirdly, I would like to comment on the use of multiple criteria. Obviously this is implied by my suggestion that the vocational psychologist is seeking the construct validity of his procedures. Now, in some instances, such as Levitt's comprehensive follow-up study of child guidance procedures, all the results for 26 different criteria were negative or below the chance level of significance. Hence the interpretation of the effectiveness of child guidance was quite easy. But what happens when some of the results are favourable, others less so? Presumably we try to generalise or to find the common element or elements among the criteria which are successfully predicted and the common elements among those which are not. This is a highly subjective process; it is far too easy to build up a clever theory by capitalising on what are really only chance differences. Thus it should not be accepted unless it can be cross-validated, i.e., by showing in a second follow-up group that the previously selected set of criteria are still predicted and the others not. Another procedure which we often found helpful is factor analysis, since it helps to sort out the various criteria into empirically connected instead of subjectively connected groups. A good example of this was provided by Ryan's work on predicting teaching success; his raw criterion data were derived initially, I think, from applying Flanagan's critical incidents technique to teacher behaviour and boiling down the data to a series of behaviour items which could be observed and rated with high reliability in the classroom. These were then factorised to yield a 3-dimensional criterion of teacher success, the three factors being more or less independent or orthogonal:

X: Understanding, friendly attitude *vs.* aloof egocentrism.
Y: Responsible, business-like, systematic *vs.* unplanned, slipshod.
Z: Stimulating, imaginative, enthusiastic teaching *vs.* dull, routine.

He was thus able to study which of his varied selection instruments correlated best with each of these main dimensions. Still another approach which seems to me methodologically sound is exemplified by Williamson and Bordin's careful follow-up of student counseling at the University of Minnesota, published in 1941. Here, a wide range of criteria were considered: college achievement, case history of social and vocational adjustment, the students' personal satisfaction, etc. All these were reduced to a single outcome of successful *vs.* unsuccessful adjustment, but the interpretation of each item and the weight to be given to it was determined by expert opinion independently of the data; in other words, the subjective judgment of the actual counselor, or of any other person who might be biased for or against a particular procedure, was completely avoided.

My final brief point concerns the development of the familiar tool of self-ratings of satisfaction. I would suggest that here we have a good deal to learn from the work of Carl Rogers and his followers at Chicago with the Q-technique, and that of other clinical psychologists who have devised such techniques as the Semantic Differential and the REP tests for analysing a person's self-concept or the inner organization of his attitudes. We might, for example, collect a number of Q-sort statements characteristic of successful and unsuccessful business executives, and correlate a client's self-sort and ideal-sort with these and with one another at various stages in his career. This seems particularly relevant to the notion of development which all the previous speakers have stressed. Stephenson's inverted factor analysis would also have applications in showing how far there are a limited number of recognizable managerial types. Perhaps this line is already being followed, but I would think that so much serious effort is nowadays being put into scientific follow-up of psychotherapeutic procedures, particularly in the United States, that vocational counselling and selection could not but benefit from cross-fertilisation with this discipline.

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The Criterion Problem in Selection and Guidance*

5.—By W. M. O'NEIL

Department of Psychology, University of Sydney

I SHOULD like to begin my attempt to tie together some of the numerous threads in the four papers which have been presented by expressing sympathy with Mr Brolly's valiant attempt to argue away the need for a criterion, for the assessment of personnel techniques against something external to them. We do not ask the company accountant or the maintenance engineer or the foreman to demonstrate his worth by measuring his performance against some clearly specified criterion; nor, if we turn to the field of personal services, do we make this demand of the family physician or the family lawyer. We do, of course, expect all of them to do a satisfactory job, to render a satisfactory service, but we ordinarily make an assessment without recourse to a criterion. Except, that is, for the vague criterion of satisfaction. One day, perhaps, Mr Brolly will be dissatisfied with the way he is choosing overseas managers for the British-American Tobacco Company and that will be the beginning of the end of his present procedures. Someone at some time may feel the same way about the accountant he has picked. The auditor will reveal too many deficiencies in the accounts, or the managing director will be dissatisfied with the inability of the accountant to give him the cost figures that he needs or with the inaccuracy of the cost figures that are given him. However, all of this is too indirect and too slow. There is, of course, a special reason why personnel officers and guidance workers need to prove themselves. While there are good and bad accountants, they all use the same techniques. Amongst the bad personnel and guidance workers are those whom we psychologists regard as quacks whether they be phrenologists or scientologists, and we need some test better than the management's or the client's satisfaction to show that our techniques are better than those of our unscientific competitors.

In general, Mr Chairman, though I also sympathise with your discontent with the distinction between subjective and objective criteria, I believe we should suspect the completely subjective criterion, without going as far as taking any other criterion just because it is obviously objective. What we must be on guard against is a criterion expressed completely in terms of satisfaction or satisfactoriness. It is all too easy to be taken in by what is satisfying but which in all other important respects is no different from what does not satisfy. The manager may be satisfied by some procedure for no better reason than that he introduced it; the client may be satisfied simply because he tried no other job. Nevertheless subjective judgments may be built into an adequate criterion. Some years ago, an Australian bank with a large number of branches scattered over the country asked me to help it produce a more effective annual efficiency report form. One of the questions to be answered concerned the qualities of the officers to be reported on. Any branch manager could tell me what these were but by and large the several managers did not agree with one another. When I asked a manager to name the bank clerks in his branch he would like to take with him to open a new branch and which he would like to leave for his successor in his old branch and then to describe the chosen and the rejected, a different picture emerged. The described features of the chosen were much the same no matter who the manager. These were subjective opinions but extracted in a way likely to minimise stock beliefs, personal whims and the like. You will recognise, Mr Chairman, this as a variant of your Naval boarding party technique.

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*A contribution to a Symposium held at the Fifteenth International Congress of Applied Psychology in Ljubljana, Jugo-Slavia, in August, 1964.

What we must apply to subjective assessments before adopting them as a criterion are a number of internal checks in order to establish first that they are really making discriminations and second that they are making them consistently. This is a first step in what Professor Vernon has urged as statistical means of clarifying the criterion.

Discrimination and reliability are in themselves not enough. We must also look for evidence of relevance. It is a failure to do so that leads some personnel and guidance workers to set up quite objective but quite valueless criteria. A bank clerk's efficiency may not be well established by the number of transactions he carries out or a carpenter's by the number of nails he drives. We must, of course, ask at once 'relevance for whom?' and 'relevance for what?' Professor Thompson's comments are important here, especially his distinction between an occupational model (oriented to the job and to others who are doing it) and a career model (oriented to the man's own occupational development, his own expectations and so on). The way a job is done and the way a career is worked through may have very different values for the man himself, for those using his services (his boss, his subordinates and his co-ordinates, or, if he is self-employed, his clients) and for those groups of people one calls society at large. Some reformers may be of utmost importance to mankind and yet be completely intolerable to those who are closely associated with them and, perhaps, to themselves. A foreman often values a non-troublesome operative of average productivity more than he does some highly efficient worker whose temperament induces ulcers in his immediate boss; the works-manager will regard the two operatives in a reverse way.

But as at least three of the contributors have stated or hinted, it is not merely a matter of 'relevance to whom?' There is also a long-term and a short-term relevance of a possible criterion. The learner's low production figures may have a completely different long-term significance from the same figures produced by an old hand. This is a matter where supervisor's ratings have to be looked at critically. The supervisor is all too likely to be obsessed with present usefulness to the cost of an estimate of future promise. The relative importance of a long-term and short-term reference varies, of course, from job to job, from situation to situation and person to person. All of this only goes to show that it is not a problem of the criterion but a problem of the criteria with which we have to deal.

In concluding these remarks, I should like to support Professor Vernon in his recommendations for the use of multiple criteria assessments and for a statistical clarification of them. I too have found factor analysis of the criteria of considerable value. It not only brings out the main dimensions of the multiple criteria but also can help in locating which of the criteria have little or great relevance for some particular consideration. I should like to illustrate this by brief reference to an example in the field of University education. In the Department of Psychology in the University of Sydney we have a large enrolment in our First Year course, ordinarily 1500 to 1800 students. Some of these aim to take only the one course in the subject, as a background for other studies or just as a fill-in within a total programme of studies. Some of them wish to proceed to further studies in Psychology, and we who teach them are naturally concerned to see that in giving 'passes' in first year we leave the door to further psychological study open to the right students. We have many assessments to work with such as marks for essays, for practical reports and for term tests as well as marks for the final papers in First Year (both 'objective' and essay-type); we have intelligence test scores, marks in other First Year subjects; and finally for the 500 or so each year who proceed we have essay marks, practical report marks and final examination marks in the Second Year course in Psychology. Factor analysis reveals that all these assessments fall into some three main groups. One has to do with the reproduction of factual material (something one might highly prize in assessing students beginning at the University a new subject not previously studied at school); this could be a product of their industriousness (a feature any teacher is likely to prize). A second has to do with the organization, use and expression of such knowledge as the student possesses. It is here that success in Psychology I is most closely related to success in other discursive subjects such as history, philosophy, literature and biology. Finally, there seems, though the evidence is not as clear, to be a factor of intelligence as the intelligence tests measure it; it is quite independent of the industriousness that may result in lots of factual knowledge. In the short-run, that is, in determining who should be passed or failed in Psychology I the first and second factor may well be most important, but in selecting who should go on, especially those who should go on to the Honours course, the second and the third turn out to deserve the greater attention. Though this analysis has been far from conclusive, it has helped convince me that a factor analysis of possible predictors and a multifarious set of criteria assessments taken over a period of time can be of very great value.

I am sure that we have not yet solved the problem of the criteria, but, as today's discussion has shown, we are much more sensitive to it than were our predecessors in personnel and guidance work a generation ago.

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The Self-Rating as a Measure of Employee Satisfactoriness

By D. L. A. PYM and H. D. AULD

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"THE past twenty years have enlarged the apparatus of psychological assessment and widened the areas of activity in which the manipulation of people is thought of as a technique. But in the evaluation of persons at work they have revealed the complexity of the problems without furnishing a conspicuous number of solutions." Since Davies (1950) made this statement, some signs of change have appeared. Psychologists are no longer concentrating on predictors to the almost complete exclusion of criteria, and Rodger (1965) has suggested that in the attempt to define criteria four trends are becoming apparent: dissatisfaction with the often arbitrary distinction between subjective and objective criteria; acceptance of the view that criteria must vary from time to time and place to place; acceptance of the view that the employer's expectations of the employee are important; and increasing concern with job analysis. But much remains to be done.

Apart from the discussion about the nature of occupational success in papers by Davies, Stott and Reeves (1950) the chief writers on the topic in this journal have been Heron (1954) and Sluckin (1956). Sluckin discussed methods by which criteria could be linked together in a simple composite score and Heron developed and used such a composite score. More recent research by Ghiselli (1956), Seashore, Indik and Georgopoulos (1960), and Dunnett (1963) has tended to contra-indicate the validity of overall job performance as a unidimensional construct. The problems of identification and measurement, however, unlike the poor in an affluent society, remain with us.

In the ideal research setting criteria of all kinds are abundantly available, but as Davies (1950) writes: "The disagreeable facts are that occupational adjustment takes place in real-life situations, and in real-life situations you have to take the criteria which you can get. These criteria usually possess serious limitations, but, as soon as the situation is manipulated or controlled for the purpose of eliminating these limitations, it is apt to pass from the real-life to the artificial and there is no guarantee that the findings will apply when normal conditions are resumed. If the criteria are objective, they either cover only a part of the total job (a part whose relationship to the whole cannot be precisely calculated) or they are at the mercy of forces which can neither be controlled nor disentangled from the influence of the technique which has been applied by the investigators. *If the criteria are subjective, however, though they may bear on the real nub of the matter under investigation*, they are so liable to distortion and the consistency of informants is so difficult to assume that the findings are inevitably suspect. The techniques of asking A about B are in their infancy: and the knowledge of B about himself, *even if it can be tapped efficiently, is inevitably the product of a mass of attitudes and feelings which are not all at the conscious level.*"

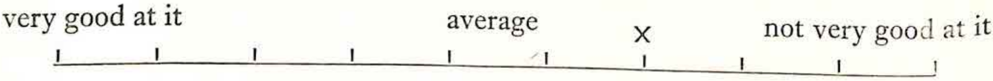
Davies has made three important points relevant to self-ratings in the statements we have italicised. First, subjective assessments can be modified and adjusted to deal with the very matter under investigation whereas objective data cannot. Second, this information can be easily and quickly obtained. Third, the self-assessment is suspect because it is liable to distortion and is the product of many feelings which are beyond control. It is largely for this last reason that self-ratings have seldom been used as a yardstick. Indeed opposition to self-assessments of this kind runs deep. For in modern society man's trustworthiness is strongly suspect and nowhere is this more apparent than at work. The enormous number of rules and regulations governing occupational behaviour, the proliferation of paper and the ever-increasing army of inspectors and checkers bear evidence of this fact. If one starts with the opposite assumption, namely that man is a responsible being who can be trusted, then the notion that he may, in many circumstances, be able to give us a useful assessment of his own effectiveness is not an illogical expectation. Nor should it be particularly difficult to check upon the consistency and accuracy of such assessments and to determine which attitudes and traits affect the rater's assessment of himself.

METHOD

The method of this enquiry was simple. Several groups of workers who were subjects of other enquiries in the Birkbeck Department of Occupational Psychology answered a single statement about their work competence, examples of which are set out below. The use of a scale with only the two ends and mid-point of the continuum defined has the advantage over the 'box' answer in that it enables the respondent to consider the whole range of responses at the same time. It also avoids the confusion which results from having to choose between points of fine distinction which may be meaningful to the researcher but are seldom meaningful to the respondent. The first statement was used with factory workers. Scientists were presented with a rather differently worded statement shown in example 2.

Example 1

How good are you at your job compared with other people doing the same kind of work? In making your assessment you should consider what your boss and your fellow workers think as well as what you think. Put a cross on the scale below showing where you consider you stand.



Example 2

How competent would you say you are at your work compared with other research workers? In making your decision consider such things as what colleagues think of your work; your contribution to the organisation you work for;

publications; and any other criteria you think important. Please indicate your answer by placing a cross on the scale below.

very competent X average not very competent
| | | | | | | | | |

Each rating was turned into a score ranging from 9 for 'very competent' to 1 for 'not very competent'. If the rater marked his place over one of the pointers, as in the second example, his score was that of the next division down, except for the final pointer under 'not very competent' when the score remained as 1. Seven different groups of workers completed the question and for four of them it was one among a large number of questions covering biographical material, job attitude, aspirations and interests.

SUBJECTS

The five principal groups of subjects were as follows:

Scientists (N=461), a cross-section of chemists engaged in research and development in the United Kingdom drawn from the membership lists of The Royal Institute of Chemistry and The Chemical Society. The information given by this group was anonymous.

Commercial Apprentices (N=102), young men (76) and women (26) engaged on a 3-4 year apprenticeship with a commercial airline. Their qualifications varied but all had at least 4 Ordinary level passes in the General Certificate of Education. The information given by this group was anonymous.

Machinists (N=85), a group of women operatives engaged in machine sewing tasks in the closing room of a boot and shoe factory in the North of England.

Technicians (N=89), young men whose ages ranged from 17 to 25 engaged in research and development work and on day release to a technical college outside London.

Programmers (N=74), young men (49) and women (25) engaged in systems analysis and programming work for an automatic data processing organisation. The information given by this group was anonymous.

Additional information was obtained from two other groups: 48 men and women, mostly in professional occupations, who were attending a two-year evening course in management, and 78 electronics maintenance engineers.

FINDINGS

Table 1 shows the distribution of scores for each group over the scale ranging from 'very competent' to 'not very competent.' For researchers and practitioners who like to work with a normal distribution a combination of scores 3, 2 and 1 which reduces the range to 7 points meets this requirement. These results suggest that with a minimum amount of instruction employees are generally better able to use the whole length of the scale when assessing themselves than their bosses are when they make their assessments. The similarity of means and standard deviations for each group indicate that some comparisons may be possible between different kinds of work.

TABLE 1:

DISTRIBUTION OF SELF-RATINGS ON A SCALE OF COMPETENCE, IN PERCENTAGES

Group	Distribution									Mean	S.D.
	9	8	7	6	5	4	3	2	1		
Scientists N=461	4	12	35	22	17	7	2	1	—	6.3	1.4
Commercial Apprentices N=102	—	1	24	28	40	5	1	1	—	5.7	1.1
Machinists N=85	12	9	11	24	34	8	2	—	—	6.1	1.6
Technicians N=89	1	13	26	23	19	15	2	1	—	5.7	1.4
Programmers N=74	4	15	26	30	14	8	1	1	1	6.2	1.5

RELIABILITY

The concept of reliability is less meaningful when applied to a measure of effectiveness than when it is applied to a test of intelligence. Low reliability in the self-rating, as in other criteria (Thorndike, 1949, p.128), is caused by intrinsic and extrinsic unreliability — inconsistency in the individual's effectiveness and inconsistency in his rating of that effectiveness. The effects of intrinsic unreliability, though it may be difficult to measure, is at least clear. The success or failure of the individual cannot be expected to be a constant. Thus if a test-retest method of measuring reliability is used, with a considerable period of time between the two ratings, changes in the individual's ratings due to changes in his effectiveness occur. These second ratings, though they may be valid, will cause a spurious decrease in the test-retest reliability coefficient. A test-retest approach with the second rating following shortly after the first overcomes this difficulty. This method, however, even using equivalent rather than identical rating scales, has its weaknesses. The self-rating is short, simple and is not a 'test.' On the re-test the individual can have little difficulty remembering how he rated himself on the first occasion, and a misleadingly high reliability coefficient could thus be obtained. Accurate measurement of reliability is thus difficult and the attempts outlined below should be considered against the points raised above.

The 48 managerial course students completed the self-rating scale twice within a fortnight. The product moment correlation between the two sets of information was .85 ($P < .001$).

The commercial apprentices completed one rating anonymously and another with their names attached about one hour later. The degree of association between the two sets of data was high, product moment r=.95 (P<.001). It is interesting to note that the mean score for the anonymous rating was considerably lower than the other, 5.7 (S.D. 1.1) against 6.5 (S.D. 1.2). (t=6.59 P<.001). It is to be expected that people will rate themselves higher if they have any suspicion that the information will be used in connection with their individual futures. Much depends on the manner in which the data is collected, in particular the confidence placed by respondents in the investigators. The technicians, for example, gave their names with the questionnaire they completed yet their mean rating of competence is the lowest of the five groups.

VALIDITY

Four groups — the Machinists, the Commercial Apprentices, the Scientists, and the Engineers — provided information on validity.

Machinists

The nature of the tasks performed by workers in the closing room of a boot and shoe factory offered a good opportunity to relate the self-rating to work performance. The operators worked independently and competence appeared to be a fairly clear cut matter expressed in terms of output. This was measured over five ten-week periods and the daily mean performance calculated for each operative over each period. As a further check the foreman was asked to rate the operatives with the help of his charge-hands. Each girl was assessed on a five point scale on competence, time-keeping and co-operation. Two sets of information were derived from these ratings, one the simple measure of competence and the other a composite based on adding the ratings of all three variables. The foreman showed himself to be both knowledgeable about his operatives and on good terms with them, which suggested that his ratings would be fairly reliable and valid. (Ferguson, 1949). The correlation matrix in Table 2 shows the relationship between the 8 variables, all the coefficients being significant (P<.001).

TABLE 2:

RELATIONSHIPS BETWEEN THE SELF-RATING, FOREMAN RATINGS AND OUTPUT FOR 85 MACHINISTS (PRODUCT-MOMENT CORRELATIONS)

Criterion	b	c	d	e	f	g	h
a Self-Rating of Competence	.52	.42	.52	.50	.49	.49	.50
b Foreman's Rating of Competence		.77	.62	.60	.60	.58	.59
c Foreman's Overall Assessment			.52	.50	.49	.43	.51
d Output Period 1 (10 weeks)				.89	.77	.68	.76
e ,, Period 2 ,,					.88	.70	.78
f ,, Period 3 ,,						.67	.71
g ,, Period 4 ,,							.88
h ,, Period 5 ,,							

Two additional points should be made about the results. The assessments were obtained shortly after period 5 and a change in organisation occurred in period 3 which probably explains the lower correlations between performances before and after that period. These results indicate that the foreman's assessments of competence are a more accurate measure of output than the self-assessments, nevertheless the range of correlations between self-ratings and output (.49 to .52) does not look too unfavourable against the range of correlations between the periods of output (.67 to .89).

Commercial Apprentices

In the previous section we considered the relationship between self-ratings and objective criteria of job performance. In the majority of jobs it is not possible to obtain wholly objective measures of competence, indeed the concept of competence is likely to be multidimensional. In the course of a validation study of a selection procedure for a group of commercial apprentices six criteria were established. These criteria were as follows:

(a) Examination Aggregate. During their apprenticeship the trainees spent six-monthly periods at a technical college studying for the Ordinary National Certificate in Business Studies and Graduateship of the Institute of Transport. Examination marks were available.

(b) Line Training Reports. Approximately once a month line supervisors rated each apprentice in their department in terms of five factors on a five point scale. Each apprentice spent several months in each department and had between 15 and 25 reports made out on him. Summing and averaging each apprentices' ratings provided a continuous and normal distribution of scores.

(c) and (d) Training Supervisors Rankings. Two training supervisors, who were responsible for the administration of the apprenticeship scheme and who had considerable daily contact with the apprentices, each ranked the apprentices in terms of 'best all-round' apprentice and 'best clerk.' The paired comparison method of ranking was used. By means of Bellows (1951) Standard Scores for Ranked Groups table, the two supervisors' rankings for each factor were combined giving a Best Apprentice Ranking and a Best Clerk Ranking.

(e) Peer Rating. Each apprentice was required to shortlist in order, the four best apprentices who he thought should be considered for the 'Best Apprentice of the Year' award. Assigning somewhat arbitrary values of four points to a first choice, three points to a second and so on, it was possible to list the order of the choice of apprentices. The list was incomplete in that not all the apprentices were mentioned.

(f) Self-Rating.

As Table 3 shows, eight of the 15 coefficients are significant at the 5% level of confidence, four of them involving self-ratings. Further analysis of the relationship between the self-rating and examination aggregate using the Mann-Whitney U Test shows that the former are significantly associated with Graduateship of

TABLE 3:

RELATIONSHIPS BETWEEN SUPERVISORS', PEER AND SELF-RATINGS AND EXAMINATION RESULTS FOR 35 COMMERCIAL APPRENTICES (SPEARMAN'S RANK CORRELATIONS)

Criteria	b	c	d	e	f
a Examination Aggregate	−.10	.47*	.32*	.23	.25
b Line Reports		.20	.29*	.26	.46*
c 'Best Apprentice' Ranking			.92*	.31	.69*
d 'Best Clerk' Ranking				.21	.63*
e Peer-Rating					.52*
f Self-Rating					

*Significant at the 5% level of confidence

the Institute of Transport results but not Ordinary National Certificate results. This finding is in accordance with the widely held view among apprentices that the former qualification is of greater practical use and repute than the latter. Similarly the apprentices believe their line training to be more important than their academic studies and this may account for the self-rating correlating better with line training reports than with examination results.

In the commercial apprentice study none of the criteria is ultimate: all are intermediate, being measures of performance in training. Furthermore, only one, examination results, is objective. The other five involve judgments being made about the apprentices by themselves and by their supervisors as no objective test of performance on the line could be devised. The fact that most of these measures are significantly intercorrelated means there is some consensus of opinion as to what distinguishes a 'good' from a 'less good' apprentice, and that this consensus of opinion is likely to be valid. The self-ratings is clearly more than simply an indicator of modesty. It is impossible from this data to say to what extent it is an accurate measure of success in training but it is at least fairly consistent with other measures of success available. Indeed it was the only criterion which was significantly related with all the others. These apprentices knew their examination results and must, to some extent, have been aware of what their supervisors and peers thought of them. In view of such 'contamination' significant correlations are to be expected; this is an argument for, not against, the value of self-ratings.

Scientists

In some kinds of work one might expect a relationship to exist between work competence and educational achievements. Such a relationship should exist among research scientists. It was predicted that scientists awarded their Doctorate of Science would be among the best researchers. It was also predicted that scientists with their Doctorate of Philosophy would be more competent than those without this qualification since Ph.Ds. would have the advantage of additional training and in many cases superior scientific ability. The evidence in Table 4 supports both of these contentions.

TABLE 4:
THE RELATIONSHIP BETWEEN THE SELF-RATING AND ACADEMIC ATTAINMENTS AMONG A GROUP OF RESEARCH CHEMISTS

Type of Qualification	N	Mean Rating	S.D.	Test of Significance
D.Sc.	14	7.57	1.07	Between D.Scs. & Ph.Ds. $t=2.5$, $p<2\%$
Ph.D.	202	6.73	1.33	
Other Qualifications	251	5.95	1.46	Between Ph.Ds. and Others $t=5.3$, $p<1\%$

Engineers

The electronics maintenance engineers were rated by two managers on a five point scale on matters which were considered crucial to the engineers effective operation, namely their technical competence, relations with customers and co-operation with the firm. Product-moment correlations with the self-rating by the engineers were .50, .69 and .57 respectively ($P < .001$).

FURTHER CORRELATES OF THE SELF-RATING

Table 5 shows the relationships between the self-rating and a number of other important variables. Although the information is not complete for all groups some conclusions can be drawn from the information.

Age

There is no reason to expect a causal relationship between age and success. However, job experience which is usually associated with age would be expected to be one factor affecting the individual's effectiveness. The low positive correlations between the self-rating and age found among three of the groups can be explained accordingly. The high correlation for the machinists is probably due to changing occupational opportunities. The older women for the most part moved into their present or similar occupations when employment opportunities were very limited. Today the work opportunities in offices and shops have increased the likelihood of the less ambitious and less intelligent girls going into factories.

Intelligence

This trait was measured by Birkbeck Test 1 (Cavanagh, 1960), a Shipley-Abstraction type test, and the relationships between the self-rating scores and intelligence are in the expected direction.

TABLE 5:

CORRELATIONS BETWEEN SIX VARIABLES AND THE SELF-RATING OF COMPETENCE

Variable	Group					
	Technicians	Scientists	Commercial Apprentices	Machinists	Programmers	Management Students
Age	–.04	.11	.08	.34**	.17	
Intelligence	.21*		.44*			
Educational Attainments	.29**	.17 (No. of degrees)	–.14		.14	
Neuroticism	–.15		–.13			
Extraversion	.37**		.02			.05
Attitudes to to Work	–.03 to .25**	.26**	–.14to.15	.24*	–.02to.12	

**denotes correlation coefficient significant at 1% level

* denotes correlation coefficient significant at 5% level

Educational Attainment

The effects of educational achievement on the self-rating has already been shown to be important among the scientists, where it was supposed that a relationship would exist between this factor and job success.

The nature of the relationship between success and educational achievements will depend on at least two factors. First the range of educational attainments within the population and second the relevance of these achievements to job performance. Among the technicians some had O.N.Cs and others G.C.E. 'A' level passes, and at the other end of the scale were those with City and Guilds passes and even a few without any qualifications. The subjects in which they were qualified, e.g., mathematics, chemistry, physics, metal work, had some bearing on their immediate work. Previous educational attainments would be expected to contribute to job success in this group and did so. The commercial apprentices on the other hand were a much more homogeneous group from the point of view of qualifications (all having at least 4 G.C.E. 'O' level passes) and the subjects in which they were qualified had little direct bearing on the tasks they were required to perform. It is not surprising that no significant association was found between the self-rating and previous educational attainments in this group.

Neuroticism and Extraversion

These traits were measured by the Abbreviated Maudsley Inventory (Eysenck, 1958). Neuroticism was not demonstrated to have an important effect upon the self-rating among the two groups in which the relationship was investigated.

The association between extraversion and the self-rating for the technicians was certainly higher than was to be expected. Indeed there seems to be no reason why extraverts should make better technicians than introverts. Among the commercial apprentices, whose training and work involved considerable contact with the public and where, therefore, extraversion might be supposed to be important, no significant relationship was found. The same result was obtained for a group of management trainees. If the self-rating is to be used as something more than a crude measure of job success, it may be found necessary in some instances to adjust the scores depending on the relevance of extraversion shown by job studies and the actual relationship found between that trait and the self-rating.

Attitudes to Work

Varying numbers of Likert type scales measuring attitude to the job, working conditions, the work group, the boss and firm were completed by each group. Correlations with the self-rating varied from −.14 to .26. Although some of the positive correlations were statistically significant the degree of association suggests that all kinds of workers are able to discriminate between effectiveness and satisfaction. The range of correlations between work related attitudes and the self-rating supports Handyside's (1961) contention that when one seeks 'to investigate relationships between satisfaction at work and efficiency at work one should be pretty explicit about which aspects of job satisfaction one is correlating with the efficiency measure.'

DISCUSSION

Purely objective criteria, such as units of output, are available for some jobs but not many and psychologists tend to be rather apologetic about presenting research using criteria involving subjective judgment — as though there was always something better but they could not get at it. Sometimes such an attitude would seem to be naive. Of course, objective criteria are rare in that they may be neither isolated nor measured, but equally importantly, it is the opinion of the writers that in many jobs they barely exist or at least are not the most important direct determinants of success. On the contrary, success is usually determined in a most subjective way — by the individual's superiors, colleagues and others judging his effectiveness and acting accordingly. It follows that if success is not directly determined by objective means there may be little point in trying to measure it in terms of objective criteria. That the 'wrong' employee is promoted and the 'right' one left to languish on the shop floor makes the former more successful than the latter whatever one may think of objectivity. This is not to say that the search for objective criteria is a waste of effort; only that it should not be done at the expense of considering subjective criteria, which, in fact, may be more valid or real in that they more accurately reflect he system of values imposed upon the individual by the job in its context.

The main purpose of this paper has been to encourage serious consideration of such a subjective criterion, the self-rating, as a measure of effectiveness at work. It is the belief of the writers that the individual, because of his unique position, can judge his own effectiveness and that given the right circumstances will do so. Moreover, his judgment will not necessarily be unsound because it is subjective. The results show that the self-rating is valid to the extent that it correlates highly with a number of other criteria, both subjective and objective. It is also valid to the extent that the individual when he assesses himself is able to take into account the range of criteria which bear on his effectiveness.

A number of other aspects of the self-rating also require attention, notably its relationship with extraversion and other dimensions of personality. At this stage, however, there seems little reason why this measure should not be used for research purposes, particularly in the validation of vocational guidance, selection and training procedures. Managers tempted to use the self-rating in a practical way for purposes of merit ratings, promotions and the like should do so with great caution. It is perhaps expecting too much of people to ask them to consider their own worth rationally when their future may be at stake.

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The Emigration of British Graduates to Canada

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IN each of recent years, hundreds of British university graduates have emigrated to Canada. Some have left immediately after graduation, others after they have acquired some years of professional experience. This brief study tells something of who the emigrating graduates are and what are their reasons for leaving Britain.

In the office of the Canadian Government Immigration Service in London information was obtained from 146 University graduates who had applied for emigration to Canada during the spring of 1963. This sample does not represent the entire number of graduates who applied during this period nor is it, in the strict sense, a random sample. It is, however, a large majority of the graduates applying for emigration to Canada through the London office at that time and is probably quite representative of British graduates generally. There are some possible biasing factors. Firstly, the sample contained a larger proportion of university lecturers and school teachers than might have been shown had the sample extended over a twelve month period. This is because graduates in these professions plan their arrival in Canada largely during August and September and make their applications for emigration during the spring months. Secondly, and less important, is the fact that many engineers and outdoor professional workers find more opportunities available for employment during the spring and early summer months. None the less, many of these latter proceed to Canada throughout the entire year.

The London Office of the Canadian Immigration Service serves the counties of Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Essex, Hampshire, Hertfordshire, Huntingdonshire, Isle of Wight, Kent, Leicestershire, Middlesex, Norfolk, Northamptonshire, Oxfordshire, Rutland, Suffolk, Surrey, Sussex, Warwickshire and Worcestershire. Other parts of the United Kingdom are served through branch offices which process applicants without reference to London. In other words, the sample referred to residents of the above counties.

In the course of his application for admission for Canada, an applicant must complete a fairly lengthy form which asks for details of citizenship, birth, places of residence, occupation, education, marital status, family, finances, salaries, etc. Also a section of value for this study was to be completed which asked:

a. Why do you wish to emigrate?
b. Why did you select Canada?

The following data were taken from the application forms:

Age
Whether or not the applicant was married.
If married, whether there were dependent children.
Faculty in which he had graduated.

Whether applicant had completed a post graduate degree.
The applicant's present salary.
Whether the applicant had previously lived (not merely visited) in another country.
Whether the applicant was destined to pre-arranged employment.
The answers to the questions on why the applicant wished to emigrate to Canada and why he chose Canada.

The 146 applicants were males. Only one female applicant turned up in the sample and her form was not considered. As wives do not complete separate forms from their husbands, it is likely that a number of female graduates did, in fact, apply for emigration at this time. However, it is interesting to notice that there were not more unmarried female applicants in proportion to the number of unmarried male applicants. Statistics do not seem to be available for the number of unmarried female graduates who emigrate to Canada but the implication from this sample is that few do so.

This raises an interesting question. According to statistics available for British graduates in Arts, Social Studies, Pure Science and Applied Science (excluding medicine) for 1961-62 who have undertaken further education or training overseas or who have gained employment overseas[1], one would predict that a sample of 146 would contain approximately 25 female graduates. Some may have gone forward with spouses and hence not be included in this sample but there is still a suspicion that the emigrating female graduate does not make Canada her destination.

The data presented in this paper are not directly comparable with the statistics presented in the Annual Report of the Department of Citizenship & Immigration, Canada[2]. That report does not use the same criterion for classification of professional status: e.g., 'professional engineer' may or may not be a university graduate whereas in this study only university graduates are considered. Furthermore, this Annual Report does not provide data on the level of formal education of immigrants.

There is a considerable number of Canadian students among the Commonwealth students who attend British universities[3] and return to Canada after graduation. However, these persons are not processed for return by Canadian immigration authorities and hence are not included in this sample.

The sample 146 graduates consisted of the following:

57 graduates in Arts, Social Sciences, Commerce or Law
32 graduates in the pure sciences,
35 graduates in the applied sciences, nearly all engineers
  (graduates of technical institutes with diplomas in applied sciences were not included in this study)
22 graduates in medicine

N = 146

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[1] *First Employment of University Graduates*, 1961-62, University Grants Committee, H.M. Stationery Office, London.

[2] *Annual Report*, Department of Citizenship and Immigration, Queen's Printer, Ottawa, 1963-1964.

[3] *Returns from Universities and University Colleges in Receipt of Treasury Grant, Academic Year* 1961-62, (Sept. 1963) University Grants Committee, H.M. Stationery Office, London.

In response to the questions "Why do you wish to emigrate?" and "Why did you select Canada?" there were 292 possible responses from the 146 subjects. The experience of immigration officials in London is that applicants do not treat these as discrete questions. They show three tendencies: (a) to answer the first question and give no response to the second, or (b) give identical responses to both questions, or (c) to omit response to either question. In practice the immigration officials do not insist on the item being completed.

For the 146 subjects a total of 233 responses were given (59 non-responses). These responses were coded into seven major themes and each response was assigned a code representing its main communication (although many responses contained multiple or peripheral themes).

The seven themes are as follows:

A. The wish for more satisfying working and living conditions; preference for the climate, society or standard of living; the wish for a better life for one's children. 68 responses were coded as containing this as a major theme.

B. The theme of 'betterness' as applied to 'better opportunity,' 'better future,' 'better career,' etc., but always referring to a relatively unspecified 'betterness.' 49 responses were coded for this theme.

A previous study[4] has pointed out that the 'better opportunity' theme is one with which the potential immigrant to Canada is bombarded by Canadian Immigration Service propaganda. Undoubtedly this would reflect in his response to these questions on his application form.

C. A statement about being promoted or transferred within one's company to a Canadian branch; the offer of a specific job opportunity or a better salary; the termination of present or recent employment. 34 responses coded.

D. The pursuit of further studies made available through grants or scholarships; the pursuit of research at a Canadian institution; or the acceptance of a Canadian academic appointment. (25 responses).

E. The theme of broadening one's professional or personal experience (e.g. to find out more about Canadian techniques; to travel and see something of the country). (25 responses).

F. Because of family connections; to marry a resident of Canada; because a Canadian wife wishes to return. (19 responses).

G. Dissatisfaction with living or working conditions in Britain. (13 responses).

With reference to the last theme, it has been suggested in a previous study[5] that British applicants may be more inhibited in attributing negative motives to their migration when required to express their motives on paper than they appear to be when discussing them orally.

It can be seen, then, that most of the responses expressed the wish for general, physical or social betterment as underlying the reasons for emigration. This appears to bear out the theory that frustrated people seek out need satisfaction in some other environment or on some other plane of their society; but when such satisfaction is not available to them within their society, then they seek relief from frustration in another society.

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[4] LAWLESS, D. J., *Motivation to Migration: Studies of Applicants in London, Cologne and Dublin*. Unpublished M.A. thesis, University of London, 1963, pp.183-185.

[5] ibid. pp. 157-158.

Responses in terms of these seven categories were next compared for the various subgroups of the 146 Ss and x^2 was computed (where it was relevant)[6] to determine whether or not there were differences between the subgroups.

Table I provides the age structure of the sample. There was no significant x^2 difference in reasons for emigration when those under 25 years of age were compared with their seniors, nor any significant difference when the under 30 years of age groups were compared with their elders.

TABLE 1: AGE STRUCTURE OF THE GROUP

under 25 years	51
25-29 years	47
30-35 years	20
over 35 years	28
N =	146

Of the sample, 86 were unmarried and when these were compared with the 60 married Ss a x^2 of 4.54 was obtained (better than .05). This indicated that more of the unmarried applicants referred to the theme of broadening one's personal or professional experience by emigrating (Theme E, as above). It was further found that 13 of the 60 married Ss did not have children. When these were grouped with the unmarried subjects to provide a comparison between 'with children—without children', x^2 became 7.38 (better than .01) for the difference between subgroups on this same theme. With the same latter division a x^2 of 5.50 (better than .05) was found. This indicated a further difference on theme A—more of the applicants who were family men expressing the wish for more satisfying living and working conditions, etc.

Only five of the 47 applicants with children were under 25 years of age.

When graduates in Arts, Commerce, Law (N = 57) were compared with the remainder of the group, a x^2 of 5.23 (better than .05) was found which indicated preference for theme (B) i.e. more Arts graduates responding to the idea of an unspecified betterment in terms of career, future, opportunity, etc., than the non-Arts graduates.

Science graduates were compared with non-Science graduates and Medical graduates were compared with non-Medicals but no significant chi-square was found for either.

However, when Applied Science graduates were compared with non-Applied Scientists a x^2 of 5.30 (better than .05) was found with more Applied Science graduates stating their dissatisfaction with living and working conditions in Britain than the others.

A difference was also found between applicants who had merely one university degree and those who had done graduate work. More of those who had not done graduate work displaying dissatisfaction with living and working conditions in Britain (theme G) ($x^2 = 6.40$, better than .02). Thus it would appear that senior professional men are not 'pushed' but rather 'pulled' overseas.

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[6] SIEGEL, S., *Nonparametic Statistics for the Behavioral Sciences*. McGraw-Hill, 1956, pp. 110.

It was possible to obtain a statement of present annual income from 144 of the 146 subjects and some comparisons were made of the stated reasons of the various salary subgroups. Some of the implications may appear to be obvious but none the less it is interesting to examine the data.

TABLE 2: STATED SALARIES

less than £1,000 p.a.	N = 71
£1,000-£1,499 p.a.	N = 37
£1,500 p.a. upwards	N = 36
salary unknown	N = 2
Total ...	= 146

Those with salaries of less than £1,000 differed from the others on two stated reasons. Firstly, fewer stated theme C (x^2 =better than .01), i.e., they emigrated less because of promotion, job offer, better salary, etc. Secondly, on theme E, more wished to broaden their personal and professional experience by emigrating travelling, etc. (x^2 = better than .02).

When compared with the £1,000 to £1,499 group, there was the same difference evident in theme C (x^2 = better than .05), i.e., more applicants with a salary of £1,000 to £1,499 p.a. were interested in promotion and salaries than those with less than £1,000 p.a.

At first glance, these statistics may appear to be the reverse of what is expected. But when one reflects that many of those with an annual income of less than £1,000 would be unmarried, adventurous, new graduates who have yet to get settled into employment, then one might infer that fewer have yet to become socially conditioned by salaries and promotions.

A similar difference was also noted between those of less than £1,000 p.a. and those over £1,500 p.a. on these same two themes (x^2 = better than .01 and better than .02).

At the time of their application, 81 applicants stated that they had arranged employment in Canada. The remaining 65 indicated that they had not yet done so or that they preferred to arrange employment after arrival. Undoubtedly some of these 65 were in correspondence with potential Canadian employers at the time of application and would have completed arrangements before leaving Britain. In one sense, then, this division is not as meaningful as it appears superficially. None the less, it raises some interesting points.

It might be noticed that the Canadian Immigration Service in London fulfils two functions. It arranges employment for many migrants through its own facilities and it facilitates such arrangements between Canadian employers and prospective migrants. A much larger ratio of professional personnel proceed to Canada with pre-arranged employment than do personnel in the trades and the service and clerical occupations. Such a ratio has always been assumed valid for two reasons: firstly, it is easier to arrange employment for professionals although they are not physically present in Canada; and secondly, that the professional worker is more loathe to take a chance by going to another country on speculation of obtaining a position than is the non-professional.

TABLE 3: EMPLOYMENT OFFER AND PRESENT SALARY

less than £1,000 p.a. with offer of employment	N = 33
less than £1,000 p.a. without offer of employment ...	N = 38
£1,000 p.a. or more with offer of employment	N = 46
£1,000 p.a. or more without offer of employment ...	N = 27
Salary unknown	N = 2
Total	= 146

TABLE 4: EMPLOYMENT OFFERS BY TYPE OF DEGREE

Degree	*N*	*Employment Offer*	%
Arts	57	30	53%
Science	32	18	56%
Applied Science	35	16	46%
Medicine	22	17	77%
	total 146	total 81	55%

Those applicants who had pre-arranged employment showed several significant chi-square differences from those without pre-arranged employment. Firstly, more with employment arranged stated theme C (better than .001), indicating promotion, transfer, job offer, better salary, etc. This would be expected, of course, from the nature of the division. They also showed x^2 = better than .001 for theme D which includes academic appointments, research, etc. This also was to be expected. However, they also showed a chi-square difference (better than .05) from those without pre-arranged employment with more of the latter indicating theme G (dissatisfaction with living and working conditions in Britain).

The last area to reveal worthwhile information dealt with whether or not the applicants had previously emigrated to any other country. The criterion of previous emigration was whether one had lived in another country (working, studying, with the military forces, etc.) and not merely had visited or travelled in other countries on a non-permanent basis).

Of the applicants 46 met the criterion of having previously emigrated. When compared with the 100 who had not previously emigrated two chi-square differences were found.

Firstly, fewer of the previous emigrants stated theme D, i.e. fewer were going for studies or academic appointments (x^2 = better than .02). Secondly, fewer significantly stated theme E, i.e. to broaden professional or personal experience, to travel, etc. The implications of this latter difference is that, having once emigrated and returned to his homeland the British migrant who re-emigrates to Canada is not likely to be an adventurer. The experience of Canadian Immigration Officials bears this out. They are unanimous in agreeing that the most adaptable migrant and the one who settles down best in Canada is the one who has had the opportunity to return to his homeland and then re-emigrate.

In conclusion, the most frequently stated reasons for wishing to emigrate among the graduates studied was for physical and personal 'betterment.' Their motivation, generally, tended to be more of a 'pull' than a 'push' type. There were some differences in the stated reasons for emigrating when the graduates were compared on the basis of type of degree held, marital status, whether or not they had completed graduate work, annual salary, whether or not they were destined to pre-arranged employment, and whether or not they had previously emigrated. More than half of the graduates had arranged employment in Canada before applying for emigration, many others probably had done so before departing.

A larger sample and a finer measuring instrument could well have supplied more detailed and more relevant information.

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Success in Technical College Courses According to Size of Firm

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INTRODUCTION

IN a study of a local technical college as many as possible of the factors likely to affect the students' achievement were investigated. The research was concerned mainly with part-time students and most of them had an apprenticeship or some form of learnership with a firm which allowed them day release. It was assumed that the attitude of a student's employer and the promotion policy of his firm would have some effect on his own attitudes to study. Again, the promotion policy was likely to be related to the general structure of the firm which was, in turn, to some extent, connected with the nature of the product. D. J. Lee was mainly responsible for this aspect of the research and this paper reports only the results of a pilot investigation in which the firms were simply differentiated by the crude yardstick of size.

Frisby, Vincent and Lancashire (1959) showed that even among firms seeking the help of the National Institute of Industrial Psychology in their selection problems there were wide differences in the academic results, with intelligence test scores held constant. The Applied Psychology Unit of the University of Edinburgh (under Denis McMahon) has been concerned with the selection of personnel for one large electrical firm which has no difficulty in recruiting apprentices, most of whom appear to be highly motivated to succeed. In his research, as in this one, Vernon's Arithmetic-Mathematics test and an abstraction test proved to be the best two predictors of success (among those used) on an Ordinary National Certificate course, but their correlations are higher than for this sample in which over 25 per cent of the top scorers failed (Montgomery, 1962). Such a result could be expected if the motivation of the students was inferior to those in Edinburgh.

PROCEDURE

The results of two surveys are reported. In the first, the academic achievements of 384 Ordinary National Certificate students in three colleges and coming from 143 firms in and around Birmingham have been followed from 1957 to 1960. The second survey started in 1960 and was concerned with 620 students in one Birmingham college attending a total of fifteen different courses, three of them Ordinary National Certificate and the rest trade courses, mainly for the Mechanical and Electrical engineering industries.

In each case the firms concerned have been divided according to the four size groups provided by the Ministry of Labour:

Size IV — Large firms with 1,000 or more employees;
Size III — Medium firms with 251 to 999 employees;

Size II — Small firms with 101 to 250 employees;
Size I — Very small firms with up to 100 workpeople.

The students were given a number of tests, at the beginning of their first year in the college, including verbal and non-verbal reasoning tests and Vernon's Arithmetic-Mathematics attainment test. Later in the year they filled in a questionnaire of 28 items, three of which were used in this part of the investigation. The first was concerned with their previous schooling and the second with an opinion rating of their employing firm. Students were asked how good they considered their firm was to work for, the answers being rated on a five-point scale from 'very good' to 'unsatisfactory'. Thirdly they were asked to give their reasons for this opinion and say what they thought the firm should do in cases where they were dissatisfied. About half the students were interviewed individually with the emphasis upon those who failed.

RESULTS

Size of firm and college attendance

It is well known that it is the large firms which are the mainstay of educational schemes for young workers and that part-time day release or other educational concessions present proportionately greater organisational problems for the smaller firms (Venables and Williams, 1961). In Sample I, 1957, containing only Ordinary National Certificate students in Mechanical and Electrical engineering the four groups of firms were almost equally represented, whereas in Birmingham, famous for the preponderance of very small businesses, only 2.5 per cent of all manufacturing industries employ 1,000 or more workpeople and 76 per cent have 100 or less. Sample II, 1960, was not confined to O.N.C. students but contained young workers studying a variety of crafts, some of which (like Radio and Television Servicing and Electrical Installation) are frequently carried out by small concerns. In this sample the proportion coming from very small firms rose to 37 per cent (just under half the figure for Birmingham) and the proportion from large firms, though smaller than in Sample I, was nevertheless seven times the figure for the city (see Table 1).

Previous schooling

In both samples the proportion of Mechanical and Electrical O.N.C. students in first year classes who had attended a grammar or technical school was under half. They are 'early leavers' who have either failed or not attempted to gain the necessary 'O' level successes to exempt them from the first year of the O.N.C. course. Among those employed by large firms, a higher proportion came from non-selective schools, and with the 1960 sample this difference was significant at the 0.01 level (see Table 2).

It is part of the selection policy of many large firms to choose their apprentices from several strata of school leavers: it is only the very specialised firm which is likely to require all its recruits to have high intellectual ability. Further, as we have seen, the very small firms are greatly under-represented among day release students and it may well be that those who do grant this facility tend to attract superior young men.

TABLE 1: STUDENTS AND SIZE OF FIRM

Number of employees	Size of Firm				Not known or not in employment
	I Up to 100	II 101-250	III 251-999	IV 1,000+	
Per cent in Birmingham area	76	15	6.5	2.5	—
Per cent of 240 firms contributing to sample II of 620 students	37	16	24	18	5
Per cent of students	21	11	21	44	3
Average number of students per firm	1.5	1.7	2.3	6.3	

TABLE 2:
PREVIOUS SCHOOLING AND SIZE OF EMPLOYING FIRM OF MECHANICAL O.N.C. STUDENTS

Size of firm	Sample		Secondary, Grammar and Technical	Modern and Comprehensive
	Date	No.		
1,000 or more employees	1957	212	45% (1)	55%
Less than 1,000	1957	172	48% (1)	52%
1,000 or more employees	1960	75	29% (2)	71%
Less than 1,000	1960	53	60% (2)	40%

(1) N.S.

(2) $p < 0.01$

Alternately in a situation where day release is not granted to everyone, perhaps it is the superior youth who presses his claim most successfully. Some of those interviewed reported that they had to ask for the 'privilege' of college attendance and others said they had changed jobs when they found it was withheld. Of the students taking City and Guilds courses only ten per cent came from selective schools and these were randomly distributed between the four types of firm.

Test Results

With O.N.C. students in both samples there was no tendency for students employed by the large firms to show significantly superior test results. Among the trade students in Sample II, those in Mechanical Engineering also showed no significant differences, but in the Electrical trades those recruited by the large firms were superior on all three tests (see Table 3).

Examination Results

(a) *O.N.C. students*

Examination results were recorded over three years with each sample and listed for each year according to whether the student had passed, failed or absented himself (Table 4). Those who transferred during the three years to City and Guilds and other courses have had their successes and failures on these included in the same way. 17 per cent of the 1957 sample transferred and 22 per cent of those studying between 1960 and 1963.

TABLE 3:

TEST RESULTS ACCORDING TO SIZE OF FIRM, 1960 SAMPLE

N=555 (65 non-engineering students omitted)*

Size of firm	Course	No. of students†	Results					
			Vernon's Arithmetic/ Mathematics		Raven's Matrices 1947		A.H.4 Total	
			Mean	S.D.	Mean	S.D.	Mean	S.D.
1,000 or more employees	O.N.C. Mech. & Elec. only	100	50.94	6.2	28.10(1)	5.4	80.28	13.9
	Mech. Trades	114	42.29	6.8	25.45	5.7	69.76	15.6
	Elec. trades	42	47.06(2)	8.6	28.13(3)	6.8	78.15(4)	12.76
	Totals	256	46.93	8.0	27.13	5.9	75.89	15.56
Less than 1,000 employees	O.N.C. Mech. and Elec. only	77	50.04	6.9	29.82(1)	5.0	80.78	12.1
	Mech. trades	99	41.70	6.4	24.24	5.2	68.98	12.0
	Elec. trades	123	41.07(2)	9.5	25.24(3)	6.6	69.09(4)	16.5
	Totals	299	43.93	9.5	26.35	6.2	73.02	16.6

† Not every student completed every test. Sample sizes are accurate to within 5 per cent.

(1) $p < .05$
(2) $p < .001$
(3) $p < .05$
(4) $p < .001$

*A few courses differing markedly in organisation and type of recruit have been omitted from most of the statistical analyses.

TABLE 4:
EXAMINATION RESULTS OVER THREE YEARS BY SIZE OF EMPLOYING FIRM
(MECHANICAL AND ELECTRICAL O.N.C. STUDENTS)

Size of firm	Date of sample	Students		Percentage of examinations		
		No.	Per cent	Passed	Failed	Not taken
1,000 or more employees	1957	212	55	51% (1)	32%	17% (2)
Less than 1,000	1957	172	45	41% (1)	35%	24% (2)
1,000 or more employees	1960	100	56	60% (3)	27%	13% (4)
Less than 1,000	1960	77	44	54% (3)	28%	18% (4)

(1) $p < .001$
(2) $p < 0.01$
(3) and (4) $p < 0.1$

For the 561 students covered by Table 4, 1,683 attendances at examinations were potentially possible during their three years of study: in fact there were 312 absences (19 per cent), 527 attendances which resulted in failure (31 per cent) and 844 in which the examination was passed (50 per cent). Absenteeism was less in the later sample but in each case it was lower for the large firms and pass rates were higher. With the larger sample the differences reach significance.

(b) *Trade students*

Results for the trade students between 1960 and 1963 are very different (Table 5). Pass rates are not a great deal lower than for the O.N.C. students but the tendency among these less academic students to abandon study when employed by the smaller firms is very much more marked. This is in part due to the reluctance of firms to continue to grant day release to unsuccessful students on these courses. In the mechanical trade classes overall absenteeism rose to 41 per cent of possible attendances for those in smaller firms and in one or two courses as many as two thirds of the original recruits ceased to attend. Individual letters of enquiry were sent each year to students who failed to re-register. The letters were not cyclostyled but made reference in each case to the particular circumstances—such as course of study—of the individual. Over 80 per cent responded, and any error in Tables 4 and 5 due to the difficulty of tracing students is insignificant. One youth employed in a small firm wrote, "I was going to continue going to school but it is not possible as I can only do a night course. I start out for work at 7.00 and get home at 6.30 and there is no time for school." Another gave as his reason for ceasing to attend "Promotion".

TABLE 5:
EXAMINATION RESULTS OVER THREE YEARS BY SIZE OF EMPLOYING FIRM
(TRADE STUDENTS) N=378

Size of firm	Type of course	Students		Percentages in Examinations		
		No.	%	Passed	Failed	Not taken
1,000 or more employees	Mechanical Trades	114	73	58%	17%	25%
	Electrical Trades	42	27	48%	20%	32%
	Totals	156	100	56% (1)	18%	26% (2)
Less than 1,000 employees	Mechanical Trades	99	45	47%	12%	41%
	Electrical Trades	123	55	43%	20%	37%
	Totals	222	100	45% (1)	16%	39% (2)

(1) and (2) $p < 0.001$

The foregoing tables include all examinations passed in the three years including those repeated and those taken after transferring to other courses. They give no measure of success in terms of qualifications gained. Persistence and success for the 384 O.N.C. students studied between 1957 and 1960 is shown in Table 6. 9 per cent of the students who sat the first year examination in 1958 obtained a certificate in 1960. The estimated figure in the Crowther Survey was 11 per cent. In the research carried out between 1960 and 1963 some attempt was made to encourage the more able students and the figure obtained was 19 per cent. In view of the concern over failure rates within the colleges following upon the Crowther Report it is likely that this result reflects improvements taking place throughout the country. It is not, even so, of such an order as to encourage complacency. The proportion abandoning the course before the completion of the three years was 28 per cent. Figures for the City and Guilds students were 28 per cent qualifying in the certificates of their first choice and 51 per cent dropping out.

In this second study the follow-up was extended for a fourth year since such a large number of students fail at one stage and thus take four years to succeed in a three year course. The results for all engineering students are set out in Table 7. Some transferred to block release courses in the second year and it was found that some students who had taken the tests in 1960 were not, in fact, attending their courses for the first time. The sample size is thus reduced from

555 to 467. The result can be presented in another way. Success on all courses at the end of the fourth year in terms of obtaining the certificate of first choice was 32 per cent (149/467) and drop out was 44 per cent (207/467). For large and small firms respectively the figures were 35 (86/249) and 29 (63/218) per cent success and 30 (75/249) and 61 (132/218) per cent drop out.

Two courses were outstandingly successful, each with a success rate of over 40 per cent. These were Radio and Television Servicing and Heating and Ventilating engineering. The first recruited students exclusively from very small firms doing repairs and on the second nearly two thirds came from fairly small undertakings. If these are omitted from the figures in Table 7 the success rate for the smaller firms falls from 29 to 21 per cent and chi square for the difference increases to 29.1.

The differences either between firms, courses or individuals are not attributable to differential ability. Those who succeeded in the second and third years had no better scores on the tests than those who got through at the end of the first year. Factors other than intelligence are operating. The small group who were given block release in the second and third years had a pass rate of about 90 per cent at each stage, with test scores which tended to be less—and which were certainly not higher—than for those who succeeded by the part-time route. Similarly the greater persistence of employees of large firms was achieved with test ability not significantly different from the whole group.

TABLE 6:

PERSISTENCE AND SUCCESS IN THREE YEARS ACCORDING TO SIZE OF FIRM (O.N.C. STUDENTS ONLY), 1957 SAMPLE, NUMBER OF STUDENTS=384

Size of Firm	Per cent sample		Year I	Year II	Year III
1,000+ employees	26	Enter	100	53	27
		Qualify	57	32	13
251-999 employees	25	Enter	100	41	11
		Qualify	51	14	5
101-250 employees	21	Enter	100	52	24
		Qualify	57	24	5
Up to 100 employees	28	Enter	100	47	13
		Qualify	57	15	2
Totals N=143	100	Enter	100	49	20
		Qualify	56	23	9

TABLE 7:

PROPORTION OF FIRMS CONTRIBUTING STUDENTS AMONG THOSE

(a) REGISTERING IN A FIRST YEAR CLASS

(b) ATTEMPTING THE FIRST YEAR EXAMINATION

(c) OBTAINING A CERTIFICATE IN THREE OR FOUR YEARS

(d) ABANDONING STUDY BEFORE QUALIFYING

N=467

Size of firm[1]	(a) Registering in a 1st yr. class		(b) Attempting the 1st yr. exam.		(c) Obtaining a certificate in 3 or 4 years		(d) Abandoning study before qualifying	
	N	%	N	%	N	%	N	%
Large	249	53	217	55	86	58	75	36
Small	218	47	176	45	63	42	132	64
Total	467	100	393	100	149	100	207	100

Chi square for differences between (c) and (d)=10.827 $p<0.001$.

[1] For Mechanical engineering students Large=1,000 or more employees and for Electrical engineering students Large=over 250 employees.

Students' opinions of their firms

All the necessary precautions were taken to reassure students that the questionnaires and interviews were confidential but, in fact, only a very few individuals showed any reluctance to say what they thought and discussion was both frank and vigorous. Their scores on verbal tests give no indication whatever of their ability and willingness to talk. Completed questionnaires were obtained from 419 students in 1960 and from 384 in 1957.

Table 8 shows the results for the different groups of the 1960 sample. Results in 1957 with the large group of O.N.C. students were similar to those obtained with the smaller group in 1960, with the probability of the differences between the firms being due to chance again reaching 1 in 1,000.

TABLE 8:
STUDENT OPINION OF EMPLOYING FIRM ACCORDING TO SIZE, 1960 SAMPLE

Size of firm	Type of course	No. of students	Very good and fairly good	Moderate to unsatisfactory
1,000 or more employees	O.N.C. Mech. and Elec.	88	81%(1)	19%
	Mech. Trades	87	55%(2)	45%
	Elec. Trades	35	60%(3)	40%
	Totals	210	67%	33%
Less than 1,000 employees	O.N.C. Mech. and Elec.	64	52%(1)	48%
	Mech. Trades	71	58%(2)	42%
	Elec. Trades	74	68%(3)	33%
	Totals	209	59%	41%
TOTALS	All courses	419	63%	37%

(1) $p < .001$
(2) and (3) N.S.

The figures in this table underestimate the amount of criticism written on the form or voiced in personal interviews. A high rating was not infrequently accompanied by critical comments about individuals or particular aspects of the work.

The causes of satisfaction and dissatisfaction were not the same for each type of firm. On the whole large ones were valued for their organisation, their sport and welfare arrangements and amenities, such as subsidised meals. Most of their apprentices on O.N.C. courses felt that good workers were valued and that it was up to them to take the chances offered. The dissatisfied ones complained that they were too impersonal, or prone to 'blue-eyed boy' favouritism. Such complaints were voiced much more frequently by the apprentices who were pursuing craft courses and among these students opinion is unrelated to the size of the company.

Outright dissatisfaction (among O.N.C. students) was greatest with the medium-sized firms which tend to fall between the two extremes, having neither the apprentice club facilities of the large undertakings nor the warm and personal intimacy of the small business. Among those working in medium-sized firms who rated them moderate to unsatisfactory, the most frequent complaints were of old-fashioned methods, out-dated equipment and lack of proper training. "The firm has no proper facilities for apprentices. They should be trained by trained men, not just left to find jobs for themselves".

This was true also to some extent for those working in small firms, but here criticism was less scathing; there was much more personal involvement and excuses were often found for any deficiencies mentioned. "The boss is very good to me and he does his best". "As it is small they do not have the best in machines but I get a chance of doing more types of job than I would at a bigger factory". Satisfaction with a smaller firm was in most cases linked with the close personal relationships which are possible in a small workshop, and frequent reference was made (particularly in interviews) to the fact that boss and apprentice were on first name terms. "The owner works with the men and the apprentice gets a lot of time devoted to him". One student, working in one of the smallest firms with less than 25 employees, included in a list of complimentary remarks "they do not worry me about my examination results".

DISCUSSION

In the education and training of young workers there is often a complete absence of contact between those responsible. The lack of communication between teachers and firms is the most obvious example of this, though within the firms themselves a person or a department can be completely unaware of the intentions of other interested persons or departments. It is thus too easy for the oversight of apprenticeship training to be nobody's responsibility. In such a situation one finds a readiness on all sides (even including some who *are* assigned this responsibility) to blame the apprentices themselves for failure and "wastage" and to assume that they are unintelligent or unambitious, though neither stricture appears on examination to be correct despite a frequently idiosyncratic approach to English.

On one of the two courses showing a particularly high level of success, contact between college and industry was very close. Drop-out in the first year was similar to that for other courses, but once the apprentice had decided to stay and the industry had decided to keep him, a close personal interest in his welfare and academic progress was maintained by both teachers and supervisors. The college programme is enthusiastically supported by the employers who leave the young worker in no doubt about their high valuation of the appropriate certificates. In the second case where achievement was high it was the attitude of the individual student which appears to have been the motivating influence. The trade recognises the need for college study and is a very popular one with school leavers, and there are more applicants than jobs. Most of the employing firms in our sample were very small electrical undertakings and their proprietors took very little personal interest in the planning of training schemes. The young men were, however, keenly aware of the value of a certificate of competence in such a competitive situation.

Among students on other courses, the belief that their employers are uninterested in certification or academic competence is widespread. This is particularly true among the craft students in the smaller firms where drop-out is so large. Inefficiency, lack of drive, and indifference to the theoretical aspects was a frequent matter for comment. A student working in a small firm with less than 100 employees wrote "the reason for which I say my firm is moderate is that it is up to me to decide if I want to go to school or not, and if I go I don't get paid for it. Another reason is that they do not offer an apprenticeship". This student left the college and in reply to the letter of enquiry wrote that he could not afford to come. Another, similarly placed, managed to stay the course and obtained an intermediate certificate in Machine Shop Engineering in the minimum time. He considered his firm "rather poor" because there is "not enough scope to learn and not enough supervision. Money is quite good, but no real amenities provided to keep the labour interested. Plenty of filth lying around the floor".

Concern about dirt and disorder was not infrequent and pleas for better conditions, better organisation, "less bosses", more consideration for the workers, more understanding of young people occur again and again from those working with the smaller companies. "They practically ignore the apprentice and his welfare". Passive resistance to or outright disapproval of "day school" was mentioned by a large number: "unsatisfactory, they do not like me going to day school". One who did quite well in an Electrical Installation course wanted his very small company to be a "bit moor sturn", and there were many comments relating to "general slackness", "old-fashioned methods", "antique machines" and "still working in the 1930s".

Typical perhaps of the successful and satisfied youth is this comment from an O.N.C. student in a large, internationally known firm: "very good: a great deal of time, expense and trouble is used for the benefit of the apprentice. Work is made as varied and interesting as possible; lectures are accompanied by visits, films etc., and provision is made for outward bound courses." The pride which such firms take in their apprenticeship schemes is usually reciprocated by their young employees—but not always. High standards of entry mean that the "failures" are only relatively inferior, and the desire of some of these to leave and seek promotion elsewhere is understandable. "You have to be perfect to get a good job with my firm, whereas you could get one elsewhere with ease".

Over 200—about half—of those answering the questionnaire added comments to explain their ratings, and in interviews the general willingness to discuss difficulties in a fair-minded way and "see both sides" was impressive. Workers of all kinds will feel sympathy for the youth employed by a small electrical firm who wrote "Moderate: might be all right on Monday and hopeless by Friday"! Another who thought his large firm was "Fairly good" added "many improvements can be made. If I said otherwise it would mean man had reached a stage in time where he knew all things about everything".

There can be no doubt that industry is a long way from such a state of affairs as far as the training of young workers is concerned. One young man wrote "the standard of work is high and thus the workers copy this standard", but far too many others found that "they never willingly teach you anything", or that "they are more interested in piece work rates than learning their apprentices their trade". The question of the teachers within industry is an important but neglected topic. How often are they trained or even "naturally" competent? One ambiguous comment leaves one guessing but uneasy—"Good instruction—bad instructors". This was from a worker in a firm of very high repute of which another apprentice wrote "offers the best apprenticeship courses in the Midlands".

The criticisms of students cannot, of course, be accepted simply as they stand: evaluation, in so far as it is possible, must depend on knowing the youth as well as his circumstances. A bright young man in a firm which sets high standards might acquire high standards himself and appear critical of a comparatively 'good' organisation, whereas his fellow with indifferent opportunities might accept uncomplainingly extremely poor conditions.

However unreliable and biased such individual comments may be considered to be, one is nevertheless left in no doubt that many school leavers find the transfer to work a very disillusioning experience. Their most bitter comments are reserved for those adults who make promises they do not—and often cannot—fulfil. In this respect the Youth Employment Officers fare badly. On their visits to schools they sometimes leave behind—however unwittingly—a rosy impression that every round peg will find his circular hole, and every would-be photographer, cabinet maker or television engineer who is subsequently "sent off to X where there was a vacancy for a fitter", feels he would have been better without the promises.

There is an impressive readiness to be loyal to a firm and to become personally involved, particularly when the employer manages to convey a genuine interest on his side. The most valued adult is the one who keep his promises, and shows "fairness to the men in all respects". The important things are: the boss "a very nice man to get on with", "good chaps to work with" and a "decent supervisor to whom you can talk to and rely on". "Favouritism", "class distinction", "no interest in apprentices", "just giving you the jobs they don't want to do themselves": these are anathema.

Among the firms represented in these samples those with over 1,000 employees gave very much more support to day release than the smaller ones. They were over-represented initially; their apprentices were more consistent in their attendance and had a greater measure of success in examinations. This support was greater for those attending National Certificate classes and their students reciprocated not only with better achievement in the course of their choice but also with very much more favourable ratings than similar students employed by smaller concerns. Percentage drop-out among trade students was very much higher, reaching just over one quarter for the large firms and about 40 per cent for the rest.

With this type of student important factors in addition to the educational policy of an individual firm appear to operate. These include, on the one hand, the policies of particular industries, laid down nationally, with which undertakings large or small are expected to comply, and, on the other, motivational forces common to students following certain trades.

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A Comparison of the Effects of a Continuous and a Linear Programmed Text on Adult Pupils

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INTRODUCTION

THE story of this experiment really began in 1934, when Little, carrying out a comprehensive investigation on two of Pressey's teaching machines, found that, while all his subjects learned more effectively when using the machines, the greatest benefit was shown by students who usually scored in the lower half of the distribution. This experiment yielded the first substantial evidence to back up the claim that the use of teaching machines evens out the differences between intelligent and unintelligent students.

In experiments on the use of films for group teaching, Hovland, Lumsdaine and Sheffield (1949) found that the advantage of immediate knowledge of results and prompting decreased with increases in intelligence of the pupils. Similar results have been reported by Irion and Briggs (1957) and by Ferster and Sapon (1958). A comprehensive study by Porter (1959) further confirmed these findings. He compared the use of teaching machines, of the lever-operated linear type, with a conventional classroom method of teaching spelling to elementary schoolchildren. He found a positive correlation between intelligence and achievement in the group taught by the conventional method but no significant correlation in the group taught by machines. Not all the reported experiments confirm these results, however. Silberman (1961) found a positive correlation between intelligence and amount of learning in high school students taught logical relationships with a multiple choice program. Shay (1961), experimenting with programs to teach the use of numerals to fourth-grade pupils, found that intelligence was correlated with the post-test scores.

Several experiments carried out by Stolurow and his co-workers, and summarised by Stolurow (1961), have shown that the order in which the same steps occur in a program can greatly affect subjects' rates of learning. When the optimum sequence was used, subjects' rates of learning were not correlated with their scores on intelligence tests, but the amount of learning *was* correlated with intelligence test scores under poor sequence conditions and when the program was too difficult for the subjects. Stolurow also claims that subjects' performance under good sequence conditions, although it was not correlated with intelligence, *was* correlated with subjects' scores on three of Guilford's creativity tests — Consequences, Unusual Uses, and Plot Titles.

If these results were to be confirmed, they would have two valuable practical applications. Firstly, if it should transpire that intelligence tests are not good predictors of ability to profit from programmed instruction, then it would be most useful to have some other sort of test, which *is* a good predictor, and these results suggest that Guilford's creativity tests may be suitable for this purpose. Secondly, the above results are of particular interest to anyone concerned with the training of older workers. It has already been suggested that teaching machines and other programmed methods of instruction might be used in industrial training and a vital question is whether these methods, as compared with traditional methods, will be relatively more, or less, efficient for older workers than they will be for younger ones. Non-verbal intelligence falls off with age (Foulds, 1949, and Raven, 1948). Some creativity scores similarly decline when intelligence differences are controlled but individual differences in creativity, which are independent of age, still exist in what Guilford calls 'spontaneous flexibility' (Chown, 1961). On Raven's 1938 Progressive Matrices test, the decline has already begun by the late twenties whereas highest scores on Brick Uses are achieved in the late forties, those on Blots from age 40-54 and, on Unusual Uses, performance is flat from age 20-60.

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The aim of the present experiment was to check the results reported by Stolurow and to discover how they applied to people of different ages. To do this, we took an old group and a young group of subjects and measured their rate of learning from a linear-programmed text and from an equivalent continuous text. We also obtained subjects' scores on intelligence tests and on tests of spontaneous flexibility. We expected that, if intelligence scores were matched across age-groups, then ability to benefit from the linear-programmed text would be (a) uncorrelated with age, (b) uncorrelated with intelligence and (c) correlated with performance on tests of spontaneous flexibility, whereas ability to benefit from the continuous text would be correlated with intelligence.

THE EXPERIMENT

Subjects

We selected forty-two female subjects, who had visited the laboratory before and whose ages and scores on the Raven's 1938 Progressive Matrices and Mill Hill synonyms tests were therefore available. They were selected in two age ranges: one had 22 subjects, aged from 20 to 36 with a mean of 28, and the other had 20 subjects, aged from 51 to 59 with a mean of 54. Each of these groups was further split into two, matched as nearly as possible for age, intelligence, and vocabulary. There were thus four groups: two young (YC and YL) and two old (OC and OL). The average Matrices score of each of these four groups was 50. The average scores on the Mill Hill synonyms test were: YC, 33; OC, 36; YL, 34; OL, 34: these scores ranged from 31 to 41. All but nine of the subjects were in paid employment. As far as could be measured on the rating scales used, there were no differences in social class or in educational level between the YC group and the YL group, or between the OC group and the OL group.

Linear text

For the linear programmed material we had to use a text, the subject-matter of which was appropriately difficult for the subjects and yet was unlikely to be known to them already. A further limitation was that it was essential that the program used should be one that had already been validated. A suitable choice appeared to be the first two sets from *The Analysis of Behaviour* (Holland and Skinner, 1961). The subject-matter of these is 'simple reflexes' and 'conditioned reflexes,' which our subjects were unlikely to have met before.

The linear text was presented to the subjects in the form of two expendable booklets, one for each set of items. Each page of these contained only one item and was divided into three columns. In the left-hand column was the answer to the item on the previous page; in the centre was an item of the program, with the blanks represented by dashes; and in the right-hand column were dotted lines on which the subject writes the answers, one line for each blank in the item. The backs of the pages were printed with a pattern to ensure that the answers could not be seen through the thickness of the page.

This was felt to be the least alarming of the various possible formats for linear-programmed texts, and certainly less so than the complex system used in the published version. The use of a sliding mask was a possible alternative, but that would have introduced the unknown factor of a mechanical device. We tried to have the linear and continuous text booklets looking as alike as was practicable.

Continuous text

The continuous text took the form of an expendable quarto booklet. This contained what was basically the same text as the linear booklets, but with all the blanks completed. All the redundancies were removed and the material arranged in an order which would appear more natural for ordinary reading; for example, all the sentences about salivation were gathered together in one place.

One characteristic of the learning process using a linear text is that the pupil has to keep on writing things down. Active learning having been found to be more efficient than passive learning (e.g., by Gates, 1917) it was thought desirable to introduce an active element into the learning of subjects using the continuous text, so that the two tasks would be comparable in this respect. The continuous text therefore had all the text printed on the left-hand pages, and the right-hand pages were feint ruled to encourage subjects to take notes during their learning.

In both the linear and the continuous texts, some American phrases were altered to the English equivalent; for example, 'candy' was altered to 'sweets.'

Attainment test

Although we hoped that the subject-matter of the program would be unfamiliar to all the subjects, we could not assume this to be so, and had to give a test of previous knowledge of the topics. While it would have been in some respects advisable to use a different test to ascertain the level of attainment achieved after the learning period, the advantage of using the same test before and after the learning would be that a gain score could be directly obtained.

The questions used were of a type which required the subjects to write complete sentences. For example, a question took the form 'What is elicitation?' not 'When a stimulus causes a response, the process is known as . . . '. The attainment test consisted of thirty-two questions, of which sixteen were on each set of the program. It was difficult to devise. There is some evidence that the questions varied widely in difficulty and some of the questions appear to be inter-dependent. A further trouble is that the grasp of some questions, but not that of others, might be considered essential to the understanding of the subject-matter. However, we obtained a wide range of gain scores, from 0 to 30 with no evident skewing of the distribution, so we believe that the scale was adequate to its purpose.

Creativity tests

The other tests given to the subjects during the course of experimental sessions served two purposes. They yielded information about the subjects' intellectual abilities, with particular reference to their flexibility and creativity; and they also provided a buffer task facilitating the control of the subjects' intellectual activity between the first attempt at the attainment test and the learning period, and between the learning period and the second attempt at the attainment test.

The five tests used were:

Brick uses (Guilford *et al.*, 1957). The instructions are to list as many uses as possible for a brick. The time limit is 10 minutes and the score is the number of different types of use mentioned.

Blots test (Fisher, 1950). Subjects are asked to write down all the things they think each blot might possibly represent or be. There are ten blots with a time limit of 1 minute for each and the score is the number of definite objects mentioned.

Consequences (Guilford *et al.*, 1957). Subjects are given three hypothetical situations and are asked to list the consequences in 2 minutes for each. The score used was the number of direct consequences given.

Unusual uses (Guilford *et al.*, 1957). Subjects are asked to list up to six other uses for six common objects, the normal use of which is given. The test is given in two halves, with a time limit of 5 minutes for each set of three objects. The score is the number of different unusual uses given.

Impossibilities (Guilford *et al.*, 1957). The instructions are, 'List all the complete and utter impossibilities you can think of in 4 minutes.' The score is the number of complete impossibilities given.

Experimental procedure

Each subject had visited the laboratory at least once before. This time they had been asked to come for two hours but, as usual, had been given no idea what they would be asked to do. They were tested in small groups—varying in size from 1 to 9—depending on when they were able to attend. Subjects using linear texts and those using continuous texts were never tested together, but they were mixed for age. The same experimenter invariably gave all test instructions.

The timetable of the experimental sessions was as follows:

Attainment test (first attempt) (5-15 minutes).
Brick uses test (10 minutes).
The learning material (30 minutes).

The instructions began in the same way for all groups. They were told that we were interested in ways of presenting information to people, to find out which is the easiest method for people of various ages to handle, and that it was the *methods* we were comparing this time, not the people.

If the group were to use the linear text, the booklets containing Set 1 were handed out, together with a sheet entitled 'How to use these booklets.' The experimenter then gave very full instructions on how to work through the program. These were adopted as a result of experience with pilot subjects of the older age group, who had grumbled aloud as they did the items. The sheet, 'How to use these booklets,' was adapted from the Introduction to the published version of the program. The program conventions used in Set 2 were not emphasized in the spoken instructions, because it was felt that those subjects who got as far as Set 2 would be able to refer to this sheet.

If the group were to use the continuous text, copies were handed out and the experimenter explained that notes could be written in the blank space on the right-hand pages.

For all subjects, they were told that they would have half-an-hour in which to work on the booklets, and the timing began from the close of the spoken instructions.

Break for tea (15 minutes).
Blots test (10 minutes).
Consequences (6 minutes).
Unusual uses (10 minutes).
Impossibilities (4 minutes).
Attainment test (second attempt) (unlimited time).

Any subjects who had not got on to the Set 2 booklet were told to go only as far as Question 16 of the attainment test.

RESULTS

General observations

All subjects appeared to be tired by the end of the session. Despite the careful and unhurried instructions, those using linear texts seemed to be dismayed by the sight of the booklets, whereas the others did their task without a murmur. The former also appeared to be more dismayed by the re-appearance of the attainment test at the end of the session and made remarks to the effect that it was a long time since they had been to school, that activities like this were not much in their line, and so on.

Ground covered

It was easy to assess the amount of ground covered by subjects using the linear text, as this was given directly by the number of items completed. In the YL group, the range of number of items completed was 47 to 106, with a mean of 78.7. In the OL group, it was 23 to 75, with a mean of 44.3. Apparently, the younger subjects were nearly twice as quick as the older ones.

There was no such easy way of assessing how much ground had been covered by those using the continuous text, but some light is thrown on this question by the second attempt at the attainment test. In this, one older subject did not attempt any questions on the second half of the text booklet but, apparently, all the others had read right through it. This indicates that subjects using the continuous text covered more ground than those who had to learn from the linear text.

Errors made in the text booklets

It is a commonly-held principle of linear programming that, if the error rate rises above 10% of the items attempted, then the program is too difficult for the pupil. In the linear text booklets, the error rate considerably exceeded 10% for four of the eleven young subjects and eight of the ten older ones. One of us made a further analysis of these errors, dividing them into 'reasonable' and 'stupid.' 'Stupid' errors were those which could not have been due merely to ignorance of the subject-matter, e.g. putting a word which was syntactically impossible, or which did not make any sort of sense. Such mistakes as persistently continuing to use 'reflex' instead of 'response,' were counted as 'reasonable'. Only two of the eleven young subjects made any stupid errors at all; one of them made one and the other five. These were the subjects with the highest error rates of the group. Seven of the ten older subjects made stupid errors, viz. all those who made a total of eleven or more errors made stupid ones while those making a total of less than seven errors made no stupid ones.

None of the notes which subjects made in the continuous text booklets contained any mistakes as to subject-matter.

Gains in knowledge

To arrive at a gain score for each subject, the second attempt at the attainment test was compared, question by question, with the first attempt and one point given for each question adequately answered in the second but not in the first attempt. On those rare occasions when an answer was adequate in the first attempt but not in the second a point was not awarded. We then selected subjects from the four groups in such a fashion that the groups could be matched in pairs for their scores on the first attainment test. The mean gain scores of these special sub-groups could then be compared by the Mann-Whitney U-test. Values of U and p (using two-tailed tests) for each pair of such matched subgroups are given in Table 1. Apparently, young and old subjects did not differ significantly in their gains from the continuous text whereas, with the linear text, young subjects gained more than old. It also appears that young subjects did not differ significantly in the amount they gained from the two types of text, whereas older subjects gained more from the continuous text than from the linear text.

Gains with ground covered held constant

It was a possibility to be investigated that the comparatively poor gain scores of the older subjects were due to their not having covered as much ground as the young ones had. This was done by repeating the comparison of gains while matching *both* the scores on the first attempt at the attainment test *and* the ground covered, taking only those questions of the attainment test which correspond to the smallest number of program items covered by any one subject in the matched groups. Results of applying the Mann-Whitney U-test to these restricted gain scores (using a one-tailed significance test) are given in Table 2, from which it will be seen that, even when the ground covered is held constant, older subjects gained more from the continuous text than from the linear text, and young subjects gained more from the linear text than did older ones.

TABLE 1

(N=6) YC (19.1), OC (13.5) : $U=10.5$, $p=0.27$
(N=7) YL (14.1), OL (3.7) : $U=3.5$, $p=0.005$
(N=6) YC (19.5), YL (17.0) : $U=14.5$, $p=0.64$
(N=7) OC (12.1), OL (4.57) : $U=5.0$, $p=0.012$

TABLE 2

YL (5.58), OL (2.28) : $U=7.5$, $p=0.016$
OC (5.14), OL (2.86) : $U=11.0$, $p=0.049$

TABLE 3

	YC	OC	YL	OL
Raven	0.02	0.20	0.25	0.40
Mill Hill	0.07	0.16	0.23	0.42

TABLE 4

	YC	OC	YL	OL
Brick uses	0.68*	0.41	0.23	0.48*
Unusual uses	−0.17	0.67*	0.27	0.07
Blots	0.26	0.14	0.16	0.40
Consequences	0.09	0.21	0.35	0.32
Impossibilities	0.58*	0.48*	−0.15	0.24

Coefficients exceeding $p=0.05$ are marked *

Correlation of gains with test scores

Four Kendall's *tau* matrices were computed, one for each of the groups of subjects, based on age, Mill Hill score, Raven's Matrices score, attainment test scores, gain score, and ten creativity test scores. Extracts from these are given in Tables 3 and 4.

From Table 3 it will be seen that the correlations between gain scores and Raven's Matrices and Mill Hill scores were low for the YC and OC groups. There were higher, but still not significant, correlations for the YL and OL groups.

Table 4 shows that four of the correlations between creativity test scores and gain scores reached a significance level of $p=0.05$ for the YC and OC groups but only one coefficient for the YL and OL groups achieved this level.

DISCUSSION

Comparison of the two texts

The authors of the linear text claim that the error rate had been reduced to about 10% when it was used by Harvard undergraduates. On the basis of the high error rate which we obtained, it would normally be said that the linear program was too difficult for many of our subjects, particularly the older ones, and the normal treatment would be to re-write the frames causing errors, often splitting them up to make comprehension easier. However, our other subjects, closely matched for intelligence, vocabulary, education, social class, and (as it turned out) creativity scores, were able to cope adequately with precisely the same material when it was presented in continuous form. The continuous text is the result of complete amalgamation of frames, just the opposite process from splitting them up, so our findings could be regarded as indicating that, particularly for older pupils, the continuous type of text may have advantages over the linear variety.

While every attempt was made to be fair to the linear text by presenting it and the continuous text in as similar a format as possible, and to ensure that those subjects who had to use the linear text were completely at ease and fully instructed, the remarks made by these subjects and their comparatively poor performance seem to indicate that they were put off by the appearance of the linear text. The large proportion of stupid errors made by the older subjects could be regarded as supporting this explanation of the continuous text's superiority.

Perhaps it must be accepted that the comparatively alarming appearance of a linear text is an intrinsic feature, which is dictated by the use of a large number of separate frames and which can be minimized by careful choice of format, but not entirely eliminated. This effect would presumably not be present in pupils with considerable experience of linear texts, but we may have to wait for a new generation of pupils before it ceases to be a problem. In the meantime, the continuous type of text may be more appropriate for some purposes than the linear type. Further experiments on the effects on older subjects of practice in using linear texts would be particularly illuminating.

We originally believed that the continuous text was comparable to the linear text, apart from the lack of certain features peculiar to linear programs, and that it was thus suitable as an experimental control. Our results suggest that this is not the case and, employing hindsight, it can be seen that they are not inconsistent with results obtained by some other workers. Those features which were eliminated from the continuous text were those which other experiments have indicated to be non-essential. Evans, Glaser and Homme (1959) and Coulson and Silberman (1960) found that cutting out the repetitions in a linear text and presenting the material in much larger frames speeds up learning without greatly decreasing retention. Evans, Glaser and Homme (1959), Roe (1960), Evans (1960), Goldbeck (1960) and Silberman *et al.* (1961) all found that not actually writing down the responses to a linear text does not significantly reduce learning, but it does speed up the rate of working. It may here be mentioned that faster working not only increases the amount of ground covered in a given time, but also has a beneficial effect on motivation.

There is need for further work on the effects of filling in the gaps of a linear text. Holland (1960) and Estes (1960) found that this increases errors and decreases retention. However, Cook and Kendler (1956), Cook (1958), Cook and Spitzer (1960), and Silberman (1961) all found that various forms of prompting improved learning.

It must be emphasized that our continuous text still incorporated much of the careful work which the original authors of the linear text had done to achieve their low error rate. It differed from an ordinary textbook in the careful hierarchical arrangement of its material and in being expressed in very clear sentences.

Correlation of gains with test scores

The number of subjects used in the experiment was small. The groups had been deliberately matched for their scores on Raven's Matrices and it subsequently transpired that they were also matched on Mill Hill scores and, to a lesser extent, on the various creativity scores. Thus the range for all these is probably restricted and this part of our results must be regarded as only tentative. However, it does suggest that the continuous text did not make a greater demand on the intelligence of the subjects than did the linear text—it is possible that neither made much demand on it—and also that creativity tests are not better predictors of performance on linear than on continuous texts.

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Programmed Learning With and Without Responding

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INTRODUCTION

A characteristic feature of programmed instruction is that the learner makes frequent overt responses and checks their correctness. This serves two functions; supplying information that is useful in developing a program, and controlling the behaviour of the learner step by step. The value of the first has been accepted almost without question. As for the second, recent experiments have tended to show that frequent responding and checking may increase the time taken to learn without raising the final level of performance. The evidence has been reviewed by Alter & Silverman (1962), Eigen & Margulies (1963), Leith (1964), and Schramm (1964).

Theoretical issues are less clear than might be supposed. As a practical matter it is important to discover the conditions in which overt responding makes instruction more effective, and tests with a wide representative sample of programs are necessary. Probably no-one would try to teach skills like reading or typewriting or using logarithms without including a large measure of practice, involving overt responses. It should be noticed that in considering the usefulness of overt responding in programmed instruction we are concerned only with the kind of subject matter that would in the ordinary way be learned by reading or listening rather than by doing.

A number of the comparisons that have been made between programmed instruction with and without overt responding have little practical significance because the program that was used was too short or too ineffective as a teacher or too unrepresentative in subject matter. The present experiment was undertaken because of the availability of an effective program of considerable length that seemed in its teaching content to be representative of many technological subjects. The subject matter also had the advantage of being unfamiliar without being esoteric and finally, conditions for assessing the effects of responding on retention were also favourable since the knowledge that the Ss gained was not likely to be put to any use during the retention interval.

MATERIALS

Program

A linear program on paper-making that had been written for graduate training (Dodd & Mitchell, 1964) was used. It has 580 frames averaging 26 words each, including revision items and items referring the trainee to a booklet of diagrams, photographs and samples. The subject matter, the basic processes of manufacturing paper, especially the beating process and the effects of variations in beating, has no special intrinsic difficulty. The learner is taught to use a set of technical terms, to recognise and describe some of the characteristics of different types of paper and to relate these characteristics to the processes of manufacture by considering cell structure, capillary action and the like.

In the ordinary form of the program, frames were arranged five per page in vertical sequence with the correct response terms for checking by the side of each item. Almost every frame required the trainee to write one or more responses and to check before going on to the next frame (*Response* version). A special form of the program was prepared for reading without responding and checking (*Reading* version). Response terms were inserted into the blanks normally left in the frames so that there was nothing to distinguish them from other words. This version of the program looked like ordinary reading matter split up into five short units per page.

Appropriately shaped masking sheets were supplied for each version of the program so that items could be exposed one by one in succession and in the case of the *Response* version so that correct response terms could be exposed for checking between frames.

Tests

Two parallel tests (forms A and B) each of forty items were constructed (with technical help from C. M. Christie) so as to sample all sections of the program equally. The questions required short answers that could be scored right or wrong. Included in the tests were 20 items taken straight from the program, two from the end of each of the ten chapters, and in addition three samples of paper were provided for Ss to characterise.

A questionnaire was made up containing direct questions on the Ss impression of the method of teaching, the subject matter and the conditions of learning.

SUBJECTS AND PROCEDURE

From a list of undergraduate students who were prepared to take part in experiments those who would guarantee to come to the laboratory for three 2-hour periods during one week were selected. Ss were told they would receive pay at the end of the experiment, a flat rate for completion and extra money for extra time beyond six hours. This method of payment meant that it was to their advantage to stay in the experiment until the work was completed, but they were given no financial incentive to learn the material or to work quickly.

Ss were allotted to the *Response* or *Reading* groups at random except that the two groups were chosen to have the same numbers of male and female and Arts and Science students. Initially 43 Ss took part and 17 were obtained later, making a total of 30 per group.

Each subject was given a pre-test (form A or B). Detailed instructions on procedure were then read out and were also repeated at the beginning of the program. On finishing the program a post-test (form A or B, the one that had not been used as a pre-test) was administered along with three samples of paper that Ss had to characterise, and the attitude questionnaire. At this point Ss were paid off and as far as they knew had finished the experiment, but they were recalled twelve weeks later and given a retention test (form A or B, the same as was used in the pre-test). They also answered three questions concerning any rehearsal and any opportunities for learning about paper making that had occurred during the twelve week interval.

RESULTS

Pre-test Scores

Out of a possible 60, scores ranged from 0 to 5 and so were disregarded in the analysis of results.

TABLE 1: LEARNING TIME IN MINUTES, N=60.

Response		*Reading*	
M	σ	M	σ
243	44	154	55

The difference between the group means is highly significant (t=6.8)

TABLE 2: POST-TEST SCORES, N=60.

	Total Possible	*Response*		*Reading*	
		M	σ	M	σ
All questions	40	29	4.9	31	6.5
Questions taken directly from frames	20	16	1.8	16	2.7
Samples	18	12	3.5	12	3.5

No difference is significant.

TABLE 3: RETENTION TEST SCORES, N=55.

	Total Possible	*Response*		*Reading*	
		M	σ	M	σ
All questions	40	19	5.5	19	7.3
Questions taken directly from frames	20	12	3.4	11	3.8
Samples	18	8	3.5	9	3.4

No difference is significant.

Time taken on tests

Ss of the first set (N=43) were timed only roughly on the post-test but it became apparent that there were differences between groups in speed of answering. Ss of the second set (N=17) were timed accurately and it was found that those from the *Reading* group took significantly longer than those from the *Response* group (Mann-Whitney test). On the retention test the difference was reduced to an insignificant level.

Attitude Questionnaire

Almost all Ss in both groups regarded the program as a good teaching method and considered the content to be interesting. Two-thirds of each group thought that they had learned more from the program than they would have learned in the same time from an ordinary book. About three-quarters of the Ss would have welcomed more opportunities for revision, although the program did in fact contain revision items. The only question that differentiated the two groups asked Ss if they would have liked to take notes. Significantly more Ss of the *Reading* group would have preferred to take notes (Mann-Whitney test).

Rehearsal

Sixteen out of twenty-eight Ss of the *Reading* group and fourteen out of the twenty-seven Ss of the *Response* group reported that during the interval between post-test and retention test they had "found themselves thinking about paper-making." Only two Ss, both in the *Reading* group had experiences during the twelve week interval that might have increased their test scores.

DISCUSSION

Since Ss of the *Reading* group finished the program in two-thirds of the time taken by the *Response* group without any inferiority in immediate performance or retention the conclusion must be that writing and checking responses wasted time. The results of the attitude questionnaire suggest that if note-taking had been allowed the advantage in time of the *Reading* group would have been reduced, and it cannot be assumed that *this* form of responding would have produced a compensatory improvement in performance. It is of interest that the *Reading* group learned as much as the *Response* group from samples and panels, as well as from the purely textual program items.

The fact that the *Response* group answered test questions more rapidly than the *Reading* group points to a temporary 'warm up' effect produced by responding during learning. This could be a source of confusion in experiments of this kind in which timed tests are used.

The subject matter of the paper-making program is in many ways typical of high-level introductory instruction within industry. Generalizing from this experiment and others of the same sort it would appear that when a subject can normally be taught without practice sessions a program on that subject will not require overt responding. It is not yet clear whether anything would be lost by presenting a program for reading in the form of paragraphs rather than frames but short frames provide good conditions for developing a program empirically and once it has been produced in this form it may read strangely if frames are run together to form pseudo paragraphs. When practice periods or progress tests are required by ordinary methods, a program that requires responding can conveniently integrate fresh instruction, consolidation and testing. This would seem to be advantageous but evidence is lacking. For a given course of instruction there is likely to be an optimal amount of overt responding which may frequently be found between the extremes of plain reading and normal linear programming, depending on such variables as the age, ability and motivation of the learner and the nature of the subject matter.

Finally, results of the type that are reported here have not appeared to lead anyone to renounce reinforcement theory but instead have turned attention towards the covert activity of the learner in situations in which he may be outwardly passive.

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Book Reviews

A Short History of British Psychology 1840-1940. By L. S. HEARNSHAW. London: Methuen, 1964. Pp. xi + 331. Price 35s.

"From a century of effort, the British contribution to which this book has outlined, a science and a profession of psychology are beginning to take shape." Professor Hearnshaw's concluding sentence reveals the scope, and the delicacy, of his task. A science and a profession are not always easy partners. The former tends to be international, restless in the pursuit of novelty, uncompromising, and thoughtless of social consequences. The latter is generally moulded in the traditions of a national setting, forced into compromise as to what novelty is tolerable to its social milieu, and mindful of human ends—if sometimes in a rather muddleheaded fashion. In any joint historical account of the two, cracks, however skilfully covered, are bound to show. But, although one is left with some impression that Professor Hearnshaw has treated the scientific side of his story as a background to the professional rather than the reverse, he tells it all with a devoted care and scholarship, a wide understanding of the immensely varied range of people, attitudes, interests and doctrines involved, and not without discreet touches of humane perception.

The history of British psychology in the nineteenth century is very largely that of men who were, in one sense or another, amateurs. Some like Wheatstone, Rayleigh, Sherrington, and Hughlings Jackson were full-time practitioners of other arts or sciences. Others, such as Thomas Young and Galton, were polymaths. But, if their pre-eminent capacity was one factor without which they could not have made the lasting contributions they did, another must surely have been the independence of any academic or professional establishment which they enjoyed. It is a fair bet that we shall never see these conditions again. And it is an important question as to how the benefits of intellectual freedom and initiative they conferred can be re-created in the different world of the future. By comparison with the size and complexity of our contemporary intellectual scene, this world of the Victorians was a microcosm in which individuals could exist not unduly belaboured by external stimulus, yet in sufficient communion with one another. Professor Hearnshaw's book gives us a fascinating, if not always a moving, picture of times when psychology, if no more than 'a hope of a science', was certainly a very lively hope.

By the end of the nineteenth century all this, and influence from overseas, has added up to an effective impact, more or less accepted by society, on practice in education and later in the treatment of the mentally sick, and on teaching and research in universities. The professional, whether an academic who devoted his whole time to psychology or a practitioner of an acknowledged art, came, if slowly, into his own. Spearman, Myers, Burt and Bartlett had difficult and complex parts to play, very different from those of their predecessors. They could no longer be freelance pioneers, but had to guide the development of their subject between engulfment in an outside world and sterility in an academic fastness. Indeed the way in which the subject greatly developed as an academic and experimental discipline depended from then on upon the interest of outside bodies. It was in his capacity as psychologist to the London County Council that Burt set the pattern of much that was done in the 1920s and 30s not only in clinical, vocational and educational psychology, but also in university laboratory and lecture room. In similar fashion, the work of Bartlett and others for the Armed Forces during World War I engaged the interest of the Industrial Fatigue Research Board and Medical Research Council and it was these bodies which later became the predominant source of support for research carried out between the wars, at least at Cambridge. Myers, by his foundation of the National Institute of Industrial Psychology (with which a surprising number of those now occupying senior posts were at one time or another associated), likewise played his part in defining the scope of the developing subject. These and a host of other factors are shown up by Professor Hearnshaw's telling of the story.

By the 1930s psychology in Britain had the strengths and the weaknesses inherent in its own evolution. Growing points vital for the future were scarcely perceptible. In particular, in spite of Grindley's early pioneering work at Cambridge on what is now known as operant conditioning, virtually no animal work was going on in university laboratories. Aside from good research—on classical lines—into sensory processes, there was hardly any physiological psychology. It might surprise many of those today employed by the National Health Service to know that in 1939 practically no opportunities existed for the psychological study of psychiatric or neurological patients. As the period covered by Professor Hearnshaw's book drew to an end, psychology was deficient in elements which were to be needed when, after the Second World War, it moved into rapid expansion. Some of the resulting weaknesses in both science and the profession remain apparent today. Professor Hearnshaw's book would have been even more fascinating and valuable had his analysis of the less gratifying features of the story been pressed with greater determination.

But the book will remain a useful one—full of people big and small, admirable sketches of growth processes, and quantities of references. It has, obviously, been a labour of love. Perhaps Professor Hearnshaw might have written a different kind of book—or books. But it seems unlikely that the book he set out to write could have been written as well by anyone else.

Post scriptum, I would like to take issue with Hearnshaw over his account of the growth of the subject in Oxford. Suspicions and hostility were by no means as universal around the year 1947 as he makes out. They were more than counterbalanced by the determined and constructive support of a number of outstanding Oxford figures, among them Sir David Ross, Canon L. W. Grensted, Professor H. J. Paton and Professor E. G. T. Liddell. These with others had met as the Committee for Psychology since 1943, and planned for the establishment of an Honours School and academic staff. Even so a start might have been much longer delayed, had it not been for the infectious enthusiasm and sound practical foresight of Dr William Stephenson, at that time Assistant Director—later Director—of the Oxford Institute. That the subject so early found itself with a fully acknowledged place in the University's studies is probably due more to Stephenson than to any other man. It seems a pity that Professor Hearnshaw does not even mention his name. Great as was the achievement of Professor Humphrey in guiding psychology through the next and far from easy phase, one may feel sure he would be the first to acknowledge what is owed to William Stephenson.

R. C. OLDFIELD

School Leavers: Their Aspirations and Expectations. By THELMA VENESS. London: Methuen, 1962. Pp. xxv+252. Price 25s.

In the early 1950s Professor Alec Mace joined one of the Productivity Teams which went to the United States in an attempt to find ways of tackling the disturbing lethargy of our economy. One impression which he and his colleagues formed was that American workers were clearly more ambitious than their trans-Atlantic cousins. Thus was generated, at Birkbeck College, the idea of investigating the ambitiousness of the English. A research group, led by Thelma Veness, set out to tackle this problem by studying a large sample of English boys and girls, all nearing the end of their schooldays, to see just how ambitious they were. The fieldwork was completed in 1956, and now Miss Veness reports and discusses the findings.

When the book first appeared in 1962 it caused a mild furore. It was alleged that it demonstrated a deplorable lack of ambition in the young people of Britain, and it was cited as further evidence of our national decline. In the press, on radio and television, indignant elders complained that it was never like this in their day, and that when they were at Charterhouse every boy aspired to become an admiral-of-the-fleet or to open up some unknown continent. Perhaps, then, the undue delay of this review may be pardoned on the grounds that it is worth reconsidering the book after the dust has settled on its attractive jacket.

The young people studied totalled 1,302, came from three contrasting areas in the

South of England, and were pupils at modern, technical, and grammar schools. The author does not claim that they were more than broadly representative of their generation: but having said that, she avoids the tentative qualifications which mar so many similar reports because, as she aptly puts it, 'the language of diffidence is cumbersome', The boys and girls completed most of the instruments of inquiry in their classrooms during a full school session, and some of them were subsequently interviewed. The eight research instruments are described in full detail. They form an imaginative combination of conventional and less orthodox techniques, and it is pleasing to find what rich material was gathered by allowing respondents to have their heads. In two essays the youngsters had a roving commission which often produced more valuable data than the questionnaires and the schedules: rather like ethological observations compared with maze-running scores. The book contains many examples of the things the school leavers wrote. They are not always grammatical and rarely inspired, but often revealing and sometimes quite moving. Anyone planning an attitude survey will profit from a consideration of the methods used here.

Most of the findings are not really surprising, and certainly not as depressing as some have suggested. In almost every area of life—home, family, work, leisure—the young people had modest but firm aspirations. Their targets were, from one point of view, tedious and humdrum; and one can understand some commentators being distressed by the almost total absence of pioneering spirits, determined innovators, and rugged individualists. But, from another viewpoint, it would have been even more disturbing if all Miss Veness's boys *had* wished to become admirals-of-the-fleet, and all her girls were aiming to be film stars. These young people were above all realists, well aware of their own limitations and of those imposed on them by society.

Readers of this journal will probably be most immediately attracted to the long chapter on work. It contains a great deal of material, and while some parts are prolix and difficult to digest others are exceptionally interesting. Besides reviewing the jobs chosen and (in some cases) actually entered, and discussing attractive and unattractive features of work, the author puts forward a promising explanation of occupational choice. She proposes a three-way classification of orientations to work, borrowing David Riesman's trichotomy of tradition-direction, inner-direction, and other-direction. The person who is tradition-directed takes a job because 'it's the done thing', and is what most people in the family or the neighbourhood seem to be doing. The inner-directed person is guided in his choice of work by the wish to find an outlet for his capacities and inclinations. Other-direction occurs in two ways. Sometimes an occupation is entered as a result of seeing someone at work in it, or having it recommended in some way. Alternatively, a job is sought because it offers satisfactions extrinsic to the work itself, for example status, high pay, or security. In some individuals, of course, all three orientations may play a part in choosing a job, though the author's data suggest that different considerations are dominant both for the sexes and for the types of secondary education. Clearly, more research on these lines is needed, but what is said here is worth the closest attention of those concerned with vocational guidance, the recruitment of young workers, and the classification of occupations. Psychologists, and other professional people, seem most likely to belong to the inner-directed group, and we must be careful not to hinder our work unwittingly by assuming that our frame of reference is shared by everybody else.

A good feature of this book is that it tries to tackle the dynamics as well as the nature of its subjects' ambitions. The chapter on motivational patterns is useful in this respect. It includes a discussion of attitudes towards advancement, an analysis of success orientation, and the results of a computer-derived 'scale of ambitiousness'. Inevitably, many of the points made here are speculative and tentative, but they are backed by enough evidence to set us thinking. The point that comes through particularly clearly is that the technical school children were the strongly ambitious ones, those at grammar schools quite keen, and the secondary moderns pretty complacent.

Easy enough, at first glance, to say that ability begat success, and success begat ambition; but then we have to explain why the technical boys and girls were the most ambitious. Perhaps having 'failed' at 11 and 'passed' at 13, the effects of positive reinforcement had been summated with those of avoidance conditioning. However, we ought also to ask whether the vocational bias at the technical schools had anything to do with their pupils' ambition and dedication. Easy enough, too, to say that the secondary modern pupils lacked 'drive' and were receiving an appropriate schooling: but there are pathetic indications, throughout the book, of the enthusiasms that were lost when these children were rejected by our educational system.

Two minor complaints: the legends of tables 9, 10, and 24 are innaccurate and obstruct their interpretation; and the mixing of notes and references at the end of the book is a discomfort which slows the rate of reading. But these are trifling criticisms of a book which has much to commend it. Miss Veness has produced a report that is rich with data and yet avoids the frequent error of being a dull catalogue of findings. Without leaping too far ahead of her material, she has not been afraid to indulge in some imaginative and stimulating speculation. Furthermore, one feels that she and her colleagues enjoyed doing this research and that they had a genuine regard for the young people who came under their scrutiny. It is refreshing, as Mace points out in his genial foreword, to find a book about teenagers which avoids being sensational. It is a relief to find someone who treats them not as mods or rockers (or, under the benign Southern Cross, hot-rodders and surfies!), but as serious people with an interest in 'the ordinary continuities of life'. By the skilful use of quotations, Thelma Veness has produced something more than an account of an investigation into ambitiousness. She has made her subjects live, and has done for adolescents what the Opies did for their younger brothers and sisters.

K. F. TAYLOR

Employment of Older Workers 1. *Job Re-design: the Application of Biological Data on Ageing to the Design of Equipment and the Organisation of Work.* By STEPHEN GRIEW. Paris: Organisation for Economic Co-operation and Development, 1964. Pp. 86. Price 15s.

Employment of Older Workers 2. *Training Methods for Older Workers.* By R. M. BELBIN. Paris: Organisation for Economic Co-operation and Development, 1965. Pp. 72. Price 12s. 6d.

The problem of how to keep men and women in later middle age at work which will use to full advantage their capacities, experience and personal qualities of stability and reliability, has two aspects. First is the design of work in such a way that older people are not handicapped by avoidable mental or physical demands. Second is the finding of methods for retraining so that those in middle age can keep pace with developments, due to new tools and materials, in the manner in which their jobs are done, and to enable those displaced by inevitable changes of industrial process, to find new work at a level of skill comparable with that of their old. Professor Griew addresses himself to the first of these aspects of the problem; Dr Belbin to the second.

Their reports are of surveys commissioned by O.E.C.D. Each is the result of a thorough study made in Europe by an acknowledged expert to find out at first hand what is going on in the employment or training of older people, and to relate it to the results of previously published research. The reports formed the principal papers at a meeting organised by O.E.C.D. in London at the end of September 1964; a meeting which, it is fair to claim, was a landmark in the study of ageing in relation to industrial performance, summing up research done and experience gained since the war and setting issues for future investigations.

Professor Griew, who used to be a member of the Unit for Research on the Employment of Older Workers, at Bristol University, divides his report into three sections. The first outlines what is known about the potentialities of older people as industrial workers, and emphasises the advantages of modifying jobs which cause difficulty so as to enable older people to continue at work of which they have experience instead of moving to other, usually less skilled jobs. The middle section surveys laboratory and field research in physiology and psychology which bears on the physical and mental capacities of older people and their abilities to perform various types of task and to withstand adverse environmental conditions. The third section looks at practical methods of redesigning jobs for older people, and is of special interest as outlining cases (at present regrettably few) where these methods have been tried. The report offers a stimulating challenge to ergonomists, work-study engineers and designers of industrial equipment, who are shown to be able greatly to affect the suitability of jobs for older people.

Dr Belbin, a former member of the Nuffield Unit for Research into Problems of Ageing, at the Cambridge University Psychological Laboratory, and who has worked for some years past as an industrial consultant, also divides his report into three main sections. After an introduction pointing out the present difficulties of people who have to change their jobs in middle age and beyond, the initial section summarises the results of laboratory research on learning and memory in relation to age, showing that older people can and do, in certain circumstances, learn much better than is popularly supposed. The second section outlines some field experiences of training or re-training older workpeople and again shows that this can be achieved successfully in many cases. The third section considers in some detail, research on methods of training older people, especially that of the Research Unit into Problems of Industrial Retraining attached to University College, London. This Unit, under Dr Eunice Belbin, is developing important new approaches to training which suggest opportunities for older people in jobs at present regarded as far beyond their reach.

Both reports are well documented with references and, although neither aims at 'popular' presentation, they are suitable for reading by those without specialist psychological knowledge. They represent a distinguished tradition of research in industrial gerontology which, although based mainly on British studies, has received significant contributions from many countries. The problem of employing and training people in middle and old age is with us to stay. It is to be hoped that these reports will help to emphasise both the reality of its existence and the possibility of its solution.

A. T. WELFORD

The Psychology of Aging. By JAMES E. BIRREN. Englewood Cliffs, New Jersey: Prentice Hall, 1964. Pp. ix + 303. Price 56s.

This book gives an integrated account of the known psychological effects of ageing. Dr Birren has a great and enviable knowledge of the literature in this field, and is able to relate psychology to sociology, physiology and biochemistry as the need arises. The reader is not allowed to forget that an adult's capacities are in the last analysis not only bounded by physical and physiological structures but also influenced by environmental conditions—and vice versa. The result is an extraordinarily good concise overview of what is known about psychological processes during adult life. It is readable, interesting, and the information given in it is reliable.

Dr Birren's theme is that a specific slowing occurs in people as they age, related not to speed of conduction within nerve cells but more possibly to an infinitesimal slowing at each nerve synapse. The consequences of this can be seen in lengthened reaction times, in increased rigidity of personality and in the increased difficulty of dealing with new material or logical problems. Physical and physiological ills often exacerbate such psychological changes but are not the only cause of them. Social factors too, such as an increase in leisure time, a decrease in income, an alteration in status, may also have psychological effects but again do not seem to be the sole cause of the changes in function.

To make his points, Dr Birren draws on pure research from many sources but favours American where more than one example could be given. While this is understandable since the book must have been written with an American audience in mind, a British reader may be misled into thinking that even less research on changes in adult performance has been done in this country than is in fact the case.

The chapter called 'Employment, productivity and achievement' might be expected to yield material of the most interest to the occupational psychologist. Difficulties of American older men in gaining employment are discussed, the age linkage of certain industries is mentioned, the lack of apparent fall-off in industrial productivity with age is noted with possible reasons for this. Lastly, Lehman's work on scientific creativity and age is described. However, there seem to be two gaps in this chapter. First, there is no overt reference to the British work on employment and age. (Le Gros Clarke is mentioned elsewhere in the book, but Shenfield or Heron and Chown on industrial management's 'climate of opinion' about ageing workers, Fleming or Murrell and Griew on the age structure of industries or trades, Emerson on retirement impact, are there only by implication in that they have undoubtedly influenced Dr Birren in his assessment and interpretation of the American studies he quotes.) Second, there is no attempt to suggest ways in which the older man's working life might be eased by application of present knowledge on ageing. The book hastens past the employed man, and concentrates on the cognitive abilities and personality of leisure time man. Here it does seem to be because research has taken the same course; industry itself has not provided many opportunities for study as yet.

Thus the occupational psychologist or other person involved in industry is more likely to find inspiration from the more 'fundamental' chapters; to read these and begin to ask questions about possible industrial applications of the findings there mentioned. As he must remain unsatisfied as to answers, may be he will be inspired to investigate a few of the problems raised in his mind by this very worthwhile book.

S. M. CHOWN

Autonomous Group Functioning. By P. G. HERBST. London: Tavistock Publications, 1962. Pp. xiii + 271. Price 36s.

This book, another from the Tavistock Institute, is intended solely for the professional specialist, namely the social psychologist, the industrial sociologist and psychologist, and the organization theorist. The author's stated objective is an exploration of methodological problems, and he claims that this brings him to the point of 'integrating psychological, sociological, economic, and technological aspects of behaviour within a single quantitative formulation'.

He makes a notably painstaking attempt to examine the inter-relationships between variables of group functioning and performance, such as the degree of co-ordination of members on a changing range of tasks, the flexibility of the consequent interaction pattern, performance satisfaction, strain (indicated by absenteeism), task involvement, and group output. These inter-relationships are subject to 'linear cyclic network analysis', simply meaning that variables are thought of as linked circle-wise, so that changes in variable A directly affect variables B and C on each side and, indirectly through either B or C, ultimately affect the value of D.

This conceptual framework is applied to a group of eight men working on a coal-face in Durham pits: by now a traditional Tavistock setting. (Herbst's work will be recognised as an aspect of the project also reported in the widely discussed *Organizational Choice* by Trist, Higgin, Murray and Pollock (1963). The data on the eight miners was recorded by one of them, the union lodge secretary, for no less than three months. He wrote down who did what, to the nearest quarter of an hour, and added comments which were later used as an indicator of group performance satisfaction. The group was autonomous, meaning that these eight men were left to decide a flexible division of tasks among themselves, using 'composite work organization' to cover the whole cycle of the mining job (as against the rigid task division of the long-wall method).

Herbst argues himself into the position of saying that because he wants 'parametric steady-state conditions' to facilitate mathematical formulation of relationships between variables, a single case is required to begin with. This is an appealing argument if one only has data on a single case anyway, but it would have greatly expanded the narrow base of this book had other groups been looked for which possessed an equal assumed steadiness, or a known unsteadiness in selected interesting parameters. Herbst is a little defeatist in front of the endemic problem of measuring the varying behaviour of varying organisms in varying environments: but behavioural scientists have to be optimists.

Somewhat disappointingly, there is no clear evidence that the autonomy of these eight miners and their readiness to muck in on anything that needed to be done made much difference to their output as a group. Though they did seem to enjoy it more while they were at it. So here is something more for the long controversy over 'participative' theory on the motivation to produce.

However, Herbst's first aim is to find algebraic expression for the relationships studied, which in themselves are not novel. From a series of postulated equations he generates a mathematical model; and the fact that this very real attempt to relate variables quantitatively catches one's attention shows that it is worthy of consideration, at a time when so few in this country submit their hypotheses to this kind of work-out. Though Herbst himself is unable to test more than a few of the relationships derived because of the limited data and measures he has available in this case.

Unfortunately, his effort gets swamped by the tide of field theorist *cum* systems analyst wordiness. For example: "A necessary condition for group survival is that the action level is maintained within a bounded region of the action space which minimally satisfies the requirements for the establishment and continuation of a positive dependence cycle." Which appears to mean that a small group within a larger social unit must do as the larger unit wants or take the consequences! An examination of fairly commonplace method problems stretched out in this phraseology dulls curiosity about the model constructed and so, becoming tedious, the book loses much of any impact it might have had.

D. J. HICKSON

Personnel Management in Developing Countries. Edited by J. E. GENDERS. London: Institute of Personnel Management, 1964. Pp. 60. Price 10s. 6d.

The editor of this booklet divides it into three parts, of which the first contains two chapters of a general nature. They attempt to examine the role of employers, unions and governments in developing countries. While the second chapter, by Damerell, is modest enough in its scope and aims, and throws up an interesting hypothesis about trade union structure in Kenya, the first by Hyde-Clark and Davidson is, unfortunately, imprecise and sociologically as well as psychologically insecure. This review will concern itself at some length with the assertion just made, but first of all would like to present one important aspect of the book for psychologists and workers abroad. Damerell (p. 16) states that "the big difference between the worker in the industrialised society and his counterpart in the developing territory is that one accepts his trade union as a continuing association while the other does not". He then observes (p. 17) that strike action is very often fully supported in Kenya even by non-trade unionists in labour forces where there are very small numbers of paid-up trade union members. Damerell's assertion about workers in 'developing countries' as a whole is, of course, as risky as the habit of looking at 'developing countries' as a whole itself is. His contribution, however, to further psychological or sociological enquiry is contained in his assertion and his observation. From these arises the hypothesis, for Kenya only *that organised trade union action arises not out of trade union membership but out of social cohesion of a different kind that finds its constitutional expression and leadership in trade unions.* Put in this fashion, the hypothesis itself suggests lines of enquiry for sociologist, psychologist, employer and government official concerned to set up negotiating machinery.

The first contribution to this booklet, by Hyde-Clark and Davidson appears, to the reviewer, to be an unfortunate collection of generalisations that have little basis in the considerable volume of sociological enquiry so far carried out in Africa and other 'developing countries'. For example, it is asserted that new social status afforded by participation in an industrialised society (p. 8) is unrecognised by traditionally-oriented people. Neither of the writers has apparently seen recent, and not so recent, studies of occupational prestige (Mitchell and Epstein: *Africa*, 29, 1959, pp. 22-40) that show clear patterns of occupational prestige along western lines to exist in Northern Rhodesia (now Zambia).

The argument continues in much the same fashion and contains such statements as 'the activities of the trade unionist act as a catalyst in awakening employers' (p. 9). Catalysts themselves remain unchanged after a reaction. Is this what is meant? Again 'the whole exercise is bedevilled by external forces, finance, religion, racialism and nationalism, and internal forces, status and colour, which are in conflict' (p. 9). The reviewer sees no psychological or sociological reason for polarising 'external' and 'internal' in this way. The words could be interchanged with no gain or loss either in meaning or in imprecision.

It is extremely unfortunate that the editor should have introduced, in this way, a booklet that has much to offer in terms of testimony and unpretentious basic information. There is an important discussion on Social Welfare on a sugar estate in Guiana by Close, articles from Nigeria by Abebe on job evaluation and by Bevan and Balogun on supervisory training. Finally, the articles by Basu on India's management problems and by Perera on joint consultation in Malaya complete the picture of a conscious attempt to apply conceptions of 'good management' to cultures other than that in which such conceptions originated.

Most interesting for the psychologist—and this may appear anomalous—is evidence of a revaluation of 'good management' procedures in light of local conditions. For example, Close (p. 23) suggests that 'paternalistic' systems of management inhibit decision-making by employees even at the level of community interaction. Epstein's *Politics in an Urban African Community* (Manchester University Press, 1958) shows a system where social decision-making was paternalism one step removed but where parallels can be drawn between sugar estates on the one hand and copper-mines on the other. Both can be contrasted with the Indian 'extended family' system of management described by Basu (pp. 29-30) and its possible implications for welfare among workers in light of the caste system. Good management is not an absolute concept cast in the British mould, despite the editor's pride in it (p. 6). It varies as the social system itself does and defies generalisation, as 'developing countries' themselves do. To give one simple example, 'incentives' are very much national, even regional, issues. What constitutes an 'incentive' for Nigerians, Malaysians or Guianians? And what are the psychological bases on which personnel decisions may be made in their respective countries? Through meetings such as those arranged by the Institute of Personnel Management and from which this booklet originated, discussion on specific industrial problems may produce questions cast in operational form from which a coherent body of psychological research may result. At present there is a grave danger of over generalisation on inadequate information. This booklet is therefore a landmark. It contains much of value to the occupational psychologist seeking examples of bad writing on insecure premisses and, on the other hand, a collection of statements about ongoing practices that show the local study of overseas management problems to be an important check on the assumptions made about the role of occupational psychology in non-western societies.

S. H. IRVINE

Behaviour. By D. E. BROADBENT. London: Methuen, 1964. Pp. 215. Price 9s. 6d.

Mr Broadbent's book, now issued as a paperback, deserves its reprinting, though mainly for its value to psychologists. It is written in plain words without jargon, as though intended for the interested layman, but it is oddly difficult to understand at times. Mr Broadbent is over economical of words, neglecting that redundancy of expression which within limits increases the chances of being understood, particularly important when jargon, that may cue our categorising, is absent.

The book may be seen in two ways, one useful, the other less so. It is useful to those already having a background of psychological knowledge, who desire a synoptic view, unencumbered by the traditional detail of experiments, of the learning theory debate from Thorndike to the present day. This is presented within the context of cogent arguments about the nature of science, the relation of theory to observation, the part to be played by physiological theories and models, and the necessity for fitting theories into the general evolutionary framework. Of particular value are Broadbent's attempts to make sense of the varied and often conflicting findings concerning reward and punishment, and the way in which he extracts from the debate arguments for theorising in terms of 'complex mechanical analogies', which theories, including modestly his own, are presented in the final chapter.

Where Mr Broadbent's book is less useful is firstly in his selectiveness, which is a bit one-sided, and secondly in his narrow and restrictive conception of science. Relatively speaking, the book neglects perception and the contribution of Gestalt psychology. All we get of the latter is a brief account of Köhler's views on insight, and his physiological speculations. Instead Mr Broadbent concentrates largely on studies of animal behaviour. His grounds for this are that such studies have produced general theories. But the Gestalt school have done just this through their work on humans. Probably they are not sufficiently behaviouristic for Mr Broadbent.

Beyond the pale for the author are the introspectionists, psychiatrists and psychoanalysts. The latter two are joined by 'saints . . . and even politicians' as possible producers of beneficial insights. But they are not scientists. It is implied that their data is too complex (Mr Broadbent's exemplars for scientists seem to be physicists and chemists rather than biologists). On the other hand the psychologists whom Mr Broadbent accepts—and he represents his standpoint as representative of all 'those people in the English-speaking countries who engage in pure academic research in psychology'—are presented as gradually resolving through rational experimental procedures many of the outstanding issues between them. Thus is their scientific approach justified. I think Broadbent exaggerates the extent to which this is so. Further, though he justifiably criticises such fictions as fractional anticipatory responses as a specious means of preserving peripheralist theories, his thesis of genuine scientists working harmoniously in their great co-operative venture produces an odd sort of valuative monotony. One would like to see more feeling for the brilliance of Lashley or Hebb, more coolness towards such *prima facie* absurdities as the Law of Effect, advanced as an explanation of learning rather than motivation.

Mr Broadbent's tone throughout is good-natured and friendly but basically he seems to me intolerant. Those working on more complex data, whether concerned with the riddle of consciousness or because of practical exigencies of everyday life, are not necessarily uncritical. Their history too can be seen as a continuous and progressive attempt to get at the truth. It is dangerous to define too narrowly such words as 'psychologist' and 'scientific'.

W. H. N. HOTOPF

Social Research and a National Policy for Science. By THE COUNCIL OF THE TAVISTOCK INSTITUTE OF HUMAN RELATIONS. Tavistock Pamphlet No. 7. London: Tavistock Publications, 1964. Pp. 44. Price 7s.

This document was originally prepared as a submission to the Heyworth Committee whose report is imminent but not yet available at the time of writing. One can only hope that the report will live up to the spirit of the Tavistock document.

Three themes pervade this closely argued plan for the development of the social sciences. The first is a powerful argument for rapid expansion of the entire field, not just support for one or the other special purpose. The Tavistock Council on the basis of careful estimates and concern with the total science budget in the country argue persuasively for "increases, in annual expenditure, of from approximately £3.5 to £25.0 millions; and in research workers, whole and part time, of from approximately

2,000 to 11,000—with 1980 as the target year". At present less than half a per cent of the country's research budget is devoted to social research; the increase suggested would raise this to 1.7 per cent. Current university expansion makes the achievement of the target for personnel possible. But in order to attract first class minds among undergraduate and graduate students to the social sciences the career patterns for workers in this field need to be made more attractive than they are. One of the sciences which the Tavistock Council includes in their discussion, psychology in as far as it is concerned with social behaviour, bears out the importance of this point: in some governmental establishments the more advanced civil service careers open to other scientists are not available to psychologists. No wonder that they suffer from personnel shortages.

The second theme of the document, the discussion of the required organisation of research establishments and support for them, is a piece of first-class social science thought about the social sciences. The authors distinguish three types of research organisations. Type A are research centres within organisations which use such research. Examples are the Home Office Research Unit or the market research departments within some large companies. Type B are university departments such as Nuffield College, Oxford. Type C are special institutes, such as the N.I.I.P. or the Tavistock Institute itself, for that matter. The financial resources for these organisations stem from the user organisations, applied research councils, the University Grants Committee, science research councils and private foundations. The Tavistock Council suggest that the first two financiers of social science research should allocate funds to all three types of organisation, while the last three should concern themselves only with types B and C. This suggestion for the social sciences is built into a broad picture of the functions and purposes of a National Sciences Development Council. This is not the place to go into details of the suggested structure; readers should consult the document itself on this point. What should be underlined here is the freedom from parochialism in the document, which rightly regards the organisation of the social sciences as a problem which must be seen in the broader context of the development of all sciences in the country.

The third theme is the Tavistock's argument for professionalism in the social sciences. This is fully developed in an appendix on 'pure' and 'applied' sciences. The authors argue that this dichotomy is of little use in the social sciences who must gather their fundamental data from the actual behaviour of people and the actual functioning of institutions. In order to be able to do this one has to get access to them through a professional relationship which provides privileged conditions for study. "The professional relationship is a first analogue of the laboratory for the social sciences. Unless he wins conditions privileged in this way, the social scientist cannot find out anything that the layman cannot find out equally well, and he can earn these privileges only by proving his competence in supplying some kind of service. In a sense, therefore, the social scientist begins in practice, however imperfect scientifically, and works back to theory and the more systematic research which may test this, and then back again to improved practice." Amen. The sooner psychologists will implement this professionalism by recognising that their subject requires statements about living people and institutions and not about variables, the greater is the chance that they will become true scientists.

MARIE JAHODA

Development of Managerial Performance: A Research Approach. By THOMAS A. MAHONEY, THOMAS H. JERDEE and STEPHEN J. CARROLL. Monograph C-9. New York: South Western Publishing Company, 1963. Pp. viii + 72.

One of the biggest problems besetting anyone involved in management training, management assessment and management selection is how to determine reliably what makes a successful manager. There is no lack of advice on the subject but most of it is not valid and the rest lacks validation. Before we can determine whether a man is doing well we must be able to determine what he is doing, and we lack a language in which we can reliably describe the nature of management performance.

This report, by the Management Development Laboratory of the University of Minnesota's Industrial Relations Centre, is a welcome addition to our knowledge of the nature of management performance, outlining concisely the construction, on a sound empirical base, of a comprehensive descriptive and analytical system which is readily intelligible and likely to be of real practical use.

The report commences with a brief review of the theoretical approaches to the analysis of management performance and the analytical framework developed to date by Fayol, Sheldon, Urwick, Simon, Carlson and others. These frameworks and recent empirical studies of management performance, for example by Hemphill, Stogdill, Shartle and Mahoney provide the basis for the approach taken in this analysis of management performance. Stogdill and Shartle in the Ohio State University studies had derived empirically from 470 Naval Officer assignments some 14 categories of administrative behaviour (as against the five or six suggested in earlier theories) and this structured and stable environment provided the basis for research into the description of the less predictable field of management performance. From preliminary pilot testing the authors derived a management performance measure comprising eight Performance Functions which appeared to be operationally definable, relevant and comprehensive—planning, representing, investigating, negotiating, co-ordinating, evaluating, supervising and staffing. (The reviewer's mnemonic is PRINCESS.) Eight Subject Dimensions were also chosen for study—employees, money, goods, equipment, methods, sales (with less memorable mnemonic). Checks of reliability followed. Research staff and 21 supervisors on courses used the scheme to classify 100 examples of management performances; groups of around 40 managers classified the time allocation to each subject and function in their jobs over periods of three weeks and over 6 months. A highly important finding from this stage was that the amount of time allocated by managers to various Performance Functions correlated highly with the importance of the function in the managers' eyes, and that this criterion was stable over time.

Management Responsibilities Checklists were then completed by 452 managers, from 13 firms with from 100 to 4000 employees engaged in manufacturing, finance, distribution or public utilities, in which the managers recorded the time allocated to Performance Functions and Subject Dimensions over a period of two weeks. At the end of this they were subjected to a battery of tests and interviews. Some 25 tables of results subsequently accompany an account of this main research.

From this analysis eight Job Types emerged. Broadly they followed the Performance Functions except that staffing and representing did not prove to be distinct job types and two new types emerged: the Multispecialist at a low level who spent more than 30% of his time on two or more functions, and the Generalist at a high level who spent less than 30% of his time on any function. Analyses are given of Job Types in terms of Performance Functions, Subject Dimensions, Activity Involved, Organisational Level, Salary and Personality Characteristics. Finally the authors indicate what in their view are the implications of their research for management development, recruitment, selection, training and salary administration. Broadly they claim that this system will provide a reliable basis for an effective scheme of management development.

The major problem for the British reader wishing to use this system is how far conclusions drawn from a sample survey of a competitive multi-racial society, with a reverence for selling and psychologists, can be generalised to apply to a homogeneous co-operative society which worships accountants and economists. A thorough study of 452 managers in 13 American firms is a significant advance on armchair sociology, but it is still only a small sample. If the funds would permit, one would like to see this study replicated by Dr Blain with the 1,000 managers in 24 companies reported on in N.I.I.P. Report 17, who are probably a much more representative sample of British industry; but this is probably too much to hope for. The need for a valid system for describing management performance is very urgent; but action frequently cannot await the results of research, and a systematic approach of unproved validity frequently gives better results than no system at all. This system will apply to British industrial organisation well enough to be of considerable value to anyone engaged in management development if used along the lines suggested by the authors.

D. C. DUNCAN

Piecework Abandoned: The Effect of Wage Incentive Systems on Managerial Authority. By WILFRED BROWN. London: Heinemann, 1962. Pp. viii + 119. Price 21s.

"Disastrous! Losing all Control!" Wilfred Brown apparently hits a sore point in his book describing the abandonment of piecework while he was Managing Director of Glacier Metal. (The book is one of a series publishing Glacier Project results.)

The reaction seems due firstly to what are conceived as attacks on production consultants and work-study practitioners, and to Brown's speculative consideration of wages systems. He certainly does describe ratefixing inaccuracies (Gomberg has done it better) and says that piecework facilitates abdication of management control. Less tactfully, he suggests that piecework incentive schemes are needed by consultants and managers, to hide from their Boards that improvement is due mainly to better management methods introduced, and much less to more pennies for more work from operators.

Viewed objectively, the book simply invites managers to ask: "What does our piecework scheme achieve, if anything? Why is it needed?" It outlines the thinking and steps in abandoning piecework at Glacier in favour of agreed hourly rates, and goes on to record an output increase from 300 to 800 bearings per hour, with some lines at 1,200 per hour, with fewer operators, better job mobility, fewer wage complaints, less clerical work and far less resistance to method and equipment changes. An example, in other words, of an Alternative Way.

A second objection to this book (expressed by a consultant) is that: "Piecework schemes are essential for control. Glacier threw away what they had: now they don't know what they've got." Glacier's success in increasing output, reducing costs and creating a climate for progressive change, indicates that adequate, if unusual, control was maintained.

Control, in its widespread negative form, does not seem to be a good substitute for positive creation of optimum output conditions. McCarthy, of Oxford, and others, said in a recent television programme, *Half-time Britain*, that piecework produced loss of control, resistance to job movement and work-quality, and allowed managers and supervisors to do nothing positive about directing or guiding the thinking of people.

The Glacier work reported in this book adds to Herzberg's explanation of the reasons for the failure of most motivation attempts. Brown shows that the basic assumption of a piece-work incentive scheme is that operator work pace, application and therefore output are influenced *solely* by money incentives. Few could nowadays disagree with his denial of this naive assumption. In fact, though it is not referred to, much confirming evidence has followed the work of Roy to show that piecework commonly results in effort and output restriction, due to group pressures in response to job rates. More importantly, in my view, piecework incentive schemes ignore the fact that production is determined by the nett inputs of management, 'the engine that powers the operator wheel', yet operators are treated and paid as if they, and they alone, controlled output.

Work-study successes in ICI and other large companies, which have stimulated efficiency programmes in the Services, in hospitals, and widely throughout British industry, do not seem to present a problem for Brown's thesis that better management organisation of work need not inevitably be linked to operator piecework. An apparently contradictory result from that of Glacier, which Brown does not mention, is that of Lincoln Electric, the largest manufacturer of electrodes and welding equipment in America. Lincoln Electric's great success was widely claimed to be due to its incentive pay scheme. James Lincoln's concept was that the driving force of man is selfishness and, through his incentive pay scheme, he aimed to make this selfishness intelligent and productive. Fortunately for Brown, Glover and Hower reported a Harvard Business School survey showing incentive pay was only one factor in the overall and positive creation of optimum output conditions at Lincoln Electric.

A report in *The Manager* recently revealed that few firms would co-operate in 'people research', despite wide agreement that much more research is needed. For his efforts at Glacier in encouraging and acting on social research, and stimulating new thinking, Wilfred Brown deserved his place in the Honours List. His book also deserves to be read.

A word of caution. One cannot simply change the form of payment system and get Glacier-type results. It is the quality of the other changes needed, in motivation, control and social engineering, which may make this a difficult book for some to understand, or to apply.

NORMAN W. BAILEY

Interpersonal Dynamics: Essays and Readings on Human Interaction. By WARREN G. BENNIS, EDGAR H. SCHEIN, DAVID E. BERLEW and FRED I. STEELE. Illinois: Dorsey Press, 1964. Pp. xv + 763. Price $8.50.

This is a set of readings that richly deserved to be put together. They are not intended to constitute a handbook of modern techniques for manipulation of interpersonal relations. Nor do they. They are intended to put pressure on our current modes of thinking about interpersonal dynamics. Most of the individual contributions go about this destructive critical task in a competent and instructive manner, and go beyond it to suggest more fruitful concepts and theories. The editors, in their five long connecting essays, have made an impressive attempt to classify and categorize those phenomena and processes of interpersonal behaviour that press us to reconsider our theories [and assumptions. We have therefore, in this book, a collection of papers that can hardly fail to provoke us into thinking more deeply about and looking more clearly at interpersonal dynamics; and many classifications and check lists that could be of practical value to the social science researcher or to the practitioner.

As the editors wisely observe they are working in a 'context of discovery' rather than a 'context of verification' (p. 11). They are very conscious that our scientific difficulties may lie in the basic assumptions we have about persons and interpersonal behaviour. They appear to be far less conscious of the probability that (a) if such difficulties exist they are more likely to concern a set of related assumptions than a single isolated one (b) that solution of the difficulties may require a bold assertion and working out of alternative sets of assumptions. Much of their own labour of intellectual construction seems to assume the very things they consider suspect. Thus, immediately after querying that the skin-bounded living human organism is the core referent of the term person, they lead off with the question "why do people come together? Why do people engage in and involve others in interpersonal relationships?" (p. 8). This presupposes that in some meaningful sense there are human psychological motivations and requirements that exist within the individual, external to and prior to group life. We might progress further if we adopted contrary assumptions and systematically explored their implications; as did Marshall C. Greco in *Group Life* (New York: Philosophical Library, 1950). Such a radical approach would very likely reveal as also did Bion's work, that our current assumptions include ones about the biological nature of man's human-ness. Concern with these might take us deeper than the fashions of 'ego-cultural' critique from which the editors take their inspiration.

F. E. EMERY

Interpersonal Competence and Organizational Effectiveness. By CHRIS ARGYRIS. Illinois: Richard D. Irwin (London: Tavistock Publications), 1962. Pp. xi + 292. Price 42s.

The emphasis in this book is on the diagnosis and cure of the behaviour which reduces interpersonal competence among managers. The book is divided into four parts. In the first of these, 'Theories and Models', Argyris gives a clear statement of his views on the nature of modern organisations, and on how efficiency is reduced by a lack of openness and mutual understanding on the part of the management team. The approach is not new to this book, but is clearly and concisely presented. In part two, he describes a procedure for diagnosing the causes of interpersonal difficulties, and for providing a feedback of information to the executives concerned. Psychologists who need to 'put over' the results of applied research projects to managers in industry should find the author's approach to this (pages 101-106) an interesting one. In part three, the laboratory programme, Argyris explains the T-Group procedure, and its effect on a group of executives. This takes the form of a number of T-Group sessions, selected to illustrate changes in attitudes which had taken place in the group. In part four, the author attempts an evaluation of the effectiveness of the T-Group sessions. In doing this he comes up against a number of methodological problems which have always made training evaluations difficult. He is able to show that the executives who took part in the T-Group sessions felt they had benefited from them, and that their ability to deal with others in interpersonal situations had improved. The evidence is less convincing when he deals with the impact of the training on the organisation as a whole, and the permanence of the changes in behaviour of the executives. A verdict of 'not proven' would seem to be a fair one.

The T-Group technique is rather better known in the United States of America than in the United Kingdom. It is a technique which is probably better suited to American organisations tending towards the 'controlled chaos' advocated by Mason Haire and others, than it is to most organisations in Great Britain. Psychologists, particularly those who are concerned with management development, should find this a useful and stimulating book.

JOHN LAKE

Airline Management. By W. S. BARRY. London: George Allen and Unwin, 1965. Pp. 352. Price 52s. 6d.

It is an accepted fact that the development and manufacture of aircraft involves the application of techniques obtained from the very frontiers of knowledge. It is not an accepted fact that the commercial operation of aircraft involves the prospect of similar pioneering in the non-technical field. Yet the second of these two propositions should be as true as the first, for few lines of activity can be so complex as the functioning of an airline.

For one thing, the basic production tool—the aeroplane—is moving at very high speed over considerable distances and this necessarily imposes an unusual burden on internal communications. For another, the sensitive nature of the operation results in the frequent upsetting of predetermined arrangements. Yet again, the essentially international character of civil aviation involves a degree of uncertainty and difficulty (particularly when it is remembered that airline personnel tend to be extraordinarily weak on foreign languages). Further complexity is caused by the constant intervention of government into civil aviation. The list is long; perhaps the only other complicating factor which should be singled out is the extraordinarily subtle nature of an airline's economic problems.

To cope with such structural problems as these, the practice of airline management might be expected to be particularly refined. Yet, for some as yet unidentified reason, airline management tends to be relatively backward. This backwardness was recently confirmed by a Council of Europe study which suggested that Europe's airlines had so concentrated on technical advance as to be untouched by the non-technical revolution which had swept through European industry in the past decade.

Here, surely, is a fitting subject for the occupational psychologist. Perhaps it was not too much to have expected Dr Barry, with an inside knowledge of British European Airways at his disposal, to have explored this territory and to have come up with some suggestions where there is room for improvement. Yet Dr Barry has chosen to restrict himself to a straightforward description of the internal and external functions that are exercised by airline managers.

To anybody who wishes to learn about these processes of airline management, Dr Barry's book will prove a useful and interesting guide. Although a few books have already delved into this field, none has done the job so comprehensively. Perhaps it was this lack of a good primer that influenced Dr Barry in his study of airline management. It is now to be hoped that this book will provide the foundation for further study into the problem of raising the quality of airline management.

JOHN SEEKINGS

Guidance in American Education: Backgrounds and Prospects. Edited by EDWARD LANDY and PAUL A. PERRY. Harvard Graduate School of Education (London: Oxford University Press), 1964. Pp. 175. Price 24s.

This is a selection from papers read to the 1963 Summer Institute for Administrators of Pupil Personnel Services which was held at the Harvard Graduate School of Education. The title disguises a seminar for counsellors and directors of educational guidance services in American schools.

In his introduction Dr Landy warns us that 'this volume presents only the core of the content of the Institute', in that much stimulating discussion was engendered by the papers which in any case have been weeded out for publication. This remaining core is very difficult to assess. The papers selected for the book range widely and include historical, philosophical. and political discussions in addition to the more expected contributions from psychologists. These are intended to relate the practice and theory of guidance to psychological theory, especially to theories of learning and personality. Unfortunately they seem mostly to be unrelated to the work of the counsellor and to each other and remain isolated and contrasting gobbets.

If the collection is worth the attention of occupational psychologists it is because of two papers. Theo Volsky in 'Vocational Development as a Behavioral Concept' analyses the process of vocational development as a sequence of behaviours in which a young person seeks to reduce discordance—between his present position and future goals, or between present activities and perceived self. He derived his orientation from the work of Feigl and from that of McCorquodale and Meehl, and his contribution deserves its place. As might be expected, D. E. Super is one of the few symposiasts to stand firmly on the earth and to talk about the practice of guidance. He delineates some important trends in the educational and occupational fields and goes on to outline their implications for the theory and practice of guidance work. Most of his trends are already apparent here and his implications for practice strike a note already familiar to people in this country concerned with vocational guidance.

Apart from these two papers, this collection gives an impression of a profession seeking a philosophical and theoretical justification for existing at all. This, one supposes, is a normal stage in the development of a profession but it does not necessarily make for good writing. Dr Landy describes the book as a 'core'; this reviewer must be forgiven if he found it indigestible.

DAVID M. NELSON

British Medical Bulletin: Experimental Psychology. Vol. 20, Number 1. Edited by A. SUMMERFIELD. London: Medical Department of the British Council, 1964. Pp. 86. Price 30s.

This number of the British Medical Bulletin contains 15 short contributions from as many British psychologists. Professor Summerfield, who combines the functions of chairman of the planning committee and scientific editor, tells us that the first eight papers 'deal with aspects of how men acquire and use skills, knowledge and information'. It is difficult to imagine doctors making much of this section. The second group of papers deals with 'relations between changes in behaviour and biological changes of one kind and another', and this surely will be more to their taste. British psychologists will be interested in all fifteen contributions.

It is impracticable to review each paper, but the immediate reactions of the reviewers might find an echo in some other readers. Pleasure, for example, that Kay recognizes Hebb's contribution; admiration for Brown's ability to spill so many words over the unknown; wonder that Treisman, Broadbent and Crossman can maintain the momentum in their chosen fields; no confidence in Gregory's explanation of the Muller-Lyer illusion; worry every time a 'decoder' pops up in a diagram of an information channel in a psychological context, because of the philosophical problems it invites; sympathy with Zangwill's feeling that experimental psychology is somewhat unrealistic; loud cheers for Weiskrantz's suggestion that sometimes models are not only unnecessary, they may be positively harmful; and vicarious pride for Swets and Tanner who have been so influential.

Taken overall do these papers, and particularly those in the first section, provide a slight indication of how a few institutions have trained experimental psychologists? They may hint at what is probably a common failing. There is a concern for technique, and in this respect professionalism flourishes. This is all to the good. But there is a danger of achieving this at some cost. A slight trace of arrogance and intolerance perhaps, and a certain naivete in the thinking which precedes and follows the technique's application. It is here that the old men of psychology were so professional, and from them we can still learn.

E. FRASER
J. SYMONS

An Introduction to Method in Psychology. By W. M. O'NEIL. Melbourne: Melbourne University Press (London: Cambridge University Press), 1962. Pp. x + 178. Price 30s.

This 1962 edition is a substantial revision of Professor O'Neil's earlier volume on scientific method in psychology first published in 1957. The major difference between the two editions is a re-arrangement of the order of topics, although in addition there has been some extensive rewriting. Throughout the author sticks closely to his intention of producing, not so much a guide book of experimental design but a discussion of principles of scientific method used in psychological investigation.

While there is notorious difficulty in for instance bringing home to the student statistical principles in a textbook where there is at least the possibility of presenting worked practice examples, the teaching of the principles of scientific method in cold blood is much more hazardous. By generously interspersing throughout his text examples from often well known psychological experiments the author to a large extent succeeds in overcoming this difficulty. It may however be felt that this book is best read as a textbook in conjunction with a laboratory course than without the benefit of such reinforcement.

Some doubt may be felt about the matching of the sophistication of the experimental examples to the audience who are, to judge from the preface, expected to be beginners. For instance, by the time we reach the second example on p. 12 we are involved in tetrad differences and Spearman two-factor theory. The book might also have been given a slightly more up to date flavour in its revision by choosing examples from current experimental topics with which the students might have more acquaintance.

In general this seems to be a book for the student well on his course who may use it for revision and summary of the principles which have been developed in practical classes. The more advanced worker should already be aware of the principles involved and not require that they should be reiterated at length.

PETER VENABLES

Nursing School Entrance Examination. By EDWARD C. GRUBER. New York: Arco, 1965. Price $6.00 (cloth), $4.00 (paper).

This book will be interesting to English readers mainly as an example of the difficulties under which American test users have to work. The first part of this book contains parallel versions of three tests, the N.L.N. (National League for Nursing) Professional Nursing Entrance Examination, the N.L.N. Pre-Nursing Examination and the Psychological Corporation Entrance Examination for Schools of Professional Nursing. Following the tests is a key giving the correct answers. This comprises about the first quarter of the book; the remainder consists of explanations of the various types of problems set in the tests and copious practice examples. The would-be candidate is advised to work through the parallel version of the test that she will be given and to correct her answers with the key. She is then advised that, where ever she has given a wrong answer, she should refer to the explanation later in the book and then work through the practice examples.

For the purpose for which this book is intended, it is really excellent. A would-be candidate who had this book and the patience to follow out the routine advised would not be very likely to fail at the examination.

Once this book has been published, the use of any of the three tests would be farcical. It is unlikely that it is unique; there are probably many other American tests that are just as completely compromised. It would be interesting to know how Americans deal with this situation. Do American test designers prepare a series of tests and scrap each in turn as soon as the 'dodge' book appears? Do American test users employ such compromised tests merely as a blind and administer at the same sitting the real test which is adequately safeguarded?

Is this situation likely to develop in England? I do not think so; the ethical standards of most English publishers are high. A test was submitted to the N.I.I.P. before publication because the publisher thought that it contained pirated material. It did and the test was not published. No doubt there are less reputable publishers, but a good test is expensive to produce and the harm to a firm caused by using a completely compromised test could be serious; both parties would have solid grounds for an action for damages. It is not very likely that a dubious publisher would risk it.

D. F. VINCENT

Other Books Received

Prime V: Basic Skills in Communication. Programed Instruction for Management Education. By AMERICAN MANAGEMENT ASSOCIATION. New York: American Management Association, 1964. Price $27.00, A.M.A. members $18.00.

Task Experience as a Source of Attitudes. By PAUL E. BREER and EDWIN A. LOCKE. Illinois: Dorsey Press, 1965. Pp. x+280. Price $10.60.

The Mentally Ill Employee: His Treatment and Rehabilitation. A Guide for Management. By THE COMMITTEE ON OCCUPATIONAL PSYCHIATRY OF THE AMERICAN PSYCHIATRIC ASSOCIATION. New York: Hoeber Medical Division, Harper and Row, 1965. Pp.x+110. Price 22s.

Psychological Tests and Personnel Decisions. By LEE J. CRONBACH and GOLDINE C. GLESER. Second Edition. Urbana: University of Illinois Press, 1965. Pp. viii+347. Price $7.95.

A Guide to Operational Research. By ERIC DUCKWORTH. London: Methuen (University Paperbacks), 1965. Pp. 153. Price 7s. 6d.

Annual Review of Psychology. Volume 16. Edited by PAUL FARNSWORTH. California: Annual Reviews, 1965. Pp. ix+571. Price $9.00.

Industrial Relations: What is Wrong with the System. By ALLAN FLANDERS. London: Institute of Personnel Management, 1965. Pp. 63. Price 8s. 6d.

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Accident Research: Methods and Approaches. By WILLIAM HADDON Jr., EDWARD A. SUCHMAN and DAVID KLEIN. New York: Harper and Row, 1964. Pp.xvi+752. Price £5 12s. 6d.

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Redundancy Payments: A Guide to the Impending Legislation. By the INSTITUTE OF PERSONNEL MANAGEMENT. London: Institute of Personnel Management. Pp. 16. Price 2s. 6d.

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Training and Education for Manpower Development: An Annotated Bibliography on Education and Training in Organizations. By EMIL A. MESICS. New York State School of Industrial and Labor Relations, Cornell University, Ithaca, 1964. Pp. iv+99. Price $1.50.

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Intervening Responses to Changes in Supervisor Job Designs

By LOUIS E. DAVIS and ERNST S. VALFER*

I: INTRODUCTION

JOB design is the organization of a job to satisfy both the technological and organizational requirements of the work to be accomplished in an organization and the personal requirements of the individual performing the work (Davis & Canter, 1955). The intent of research on job design is to examine the content and structure of jobs in order to develop theory and principles for the design of effective jobs, insofar as the individual, the organization and the process are concerned.

Social and behavioral scientists have concerned themselves extensively with the job holder's personal and social needs. Their studies have largely been limited to organizational and personal factors with the work content of the job taken as predetermined by technology and therefore not a variable suitable for study. Consequently studies of jobs and organizations emanating from these disciplines tend to have an individual orientation. Job content and its interaction with organizational structure have been given consideration only very occasionally.

At the University of California, attempts to develop job design theory and decision rules are centered around experimental approaches. Jobs are seen as part of operating socio-technical systems. Results of previous University of California studies have been reported (Davis & Canter, 1955, 1956; Davis & Werling, 1960). Such studies provided information on organization structure requirements and on environment in which workers' jobs function. Changes in workers' jobs invariably affected the jobs of supervisors and the organization structure.

This study sought to identify and evaluate some pertinent job design variables of first-line supervisory positions in order to specify the job contents of the positions and the structural relationships with other organizational units and levels. An underlying presumption of this research approach is that job performance may be enhanced by restructuring the socio-technical requirements of the job rather than by attempting to change the personality of the job holder.

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* Professor Davis is in the Human Factors in Technology Research Group, Department of Industrial Engineering, University of California, Berkeley, California; and Dr Valfer is at the Pacific Southwest Forest and Range Experiment Station of the United States Forest Service, Berkeley, California.

II: MODEL OF ORGANIZATIONAL CHANGE AND CHANGE HYPOTHESIS

A. Primary Hypothesis

It was postulated that: Lower total cost per unit of output and greater need satisfaction for the members of a work group, including the supervisor, will result from specifying the supervisor's job content in the direction of increasing his authority and responsibility by assigning to him direct control of all functions necessary to complete the product or service assigned to his work group, including inspection and final quality acceptance.

B. Response-Mechanism Model

A response model was proposed to define the process which transforms the organizational input of job modifications to organizational outputs in the form of measurable changes in such criteria as reflect organizational costs and individual's personal need satisfactions. At present the most effective organizational output criteria are those requiring measurement at the worker level. The model postulated that such inputs or causal variables will modify the personal, technological and organizational relationships within the organization by stimulating sequential mediating responses in the job holders, as shown in Figure 1. The time span between these sequential responses, and hence between input and output, is a function of the complexity of the input change and the consequent difficulty of adjusting to it. The inputs are also subject to mediating effects flowing from the social and organizational environments which can aid or hinder the assimilation process by determining the types of response behaviors which will be rewarded. Furthermore, the responses to the inputs are dependent on the motivations and experiences of the organization's members. The latter may require inputs to be matched to their personal characteristics.

When an input-output flow encompasses more than one organizational level, the output at each but the lowest level has two channels: the first is a direct output measured by job or task performance and personal need satisfaction of the individuals at that level; the other output becomes an input at the next lower level actuating its response mechanism. The multi-level model with input modifiers is shown in Figure 2.

C. Intervening Hypotheses

A set of hypotheses was established which related internal changes in response mechanism to input and output. The changes were those taking place in the perceptions and attitudes of workers and supervisors about their jobs and the organization, and in how they spent their time at work. The purpose of the intervening hypotheses is to (1) explain and test the working of the response mechanism model, (2) permit testing of descriptors defining the personal need dimensions of the members of the organization, and (3) provide intermediate predictors of output consequences before the flow time through the complete mechanism is attained. An understanding of the intervening changes in behavior will aid in the development of refined hypotheses relating job content and structure to performance and consequently to suitable job design decision rules.

The network of causal relationships from input to output assumed no confounding by changes occurring outside the response mechanism. This was not assured in spite of supporting correlational evidence. At the least, correlation between the hypothesized response mechanism and output placed this study in the same situation as most field-correlational studies. At best, correlation between input, response mechanism and output permits further elucidation of the response function.

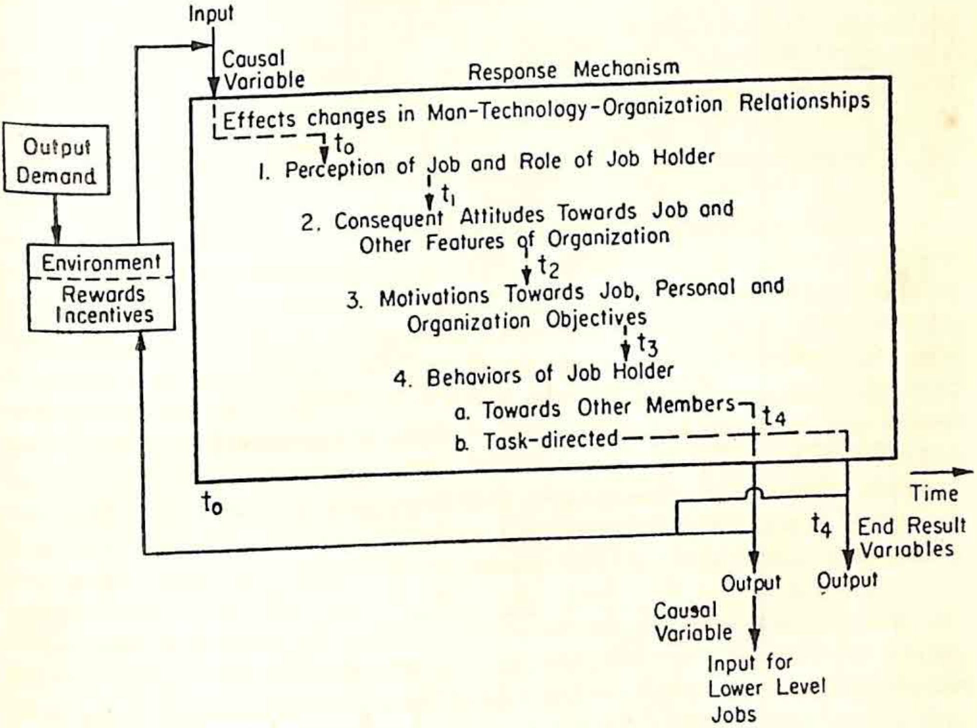

Input
Causal Variable
Response Mechanism
Effects changes in Man-Technology-Organization Relationships
t_0
1. Perception of Job and Role of Job Holder
t_1
2. Consequent Attitudes Towards Job and Other Features of Organization
t_2
3. Motivations Towards Job, Personal and Organization Objectives
t_3
4. Behaviors of Job Holder
a. Towards Other Members
b. Task-directed
t_4
Output Demand
Environment
Rewards Incentives
t_0
Time
t_4
End Result Variables
Output
Output
Causal Variable
Input for Lower Level Jobs

FIGURE 1: GENERAL RESPONSE-MECHANISM MODEL

III: EXPERIMENTAL SETTING

A. Research Organization

The study site was the industrial facility of a large military installation which had as its prime function the overhaul, repair and testing of complex aircraft and their components. With the exception of the senior executives, all of its 5900 employees were civilian, of whom some 3800 were in line functions. The study was confined to eleven shops, the basic (first-level) organizational units,

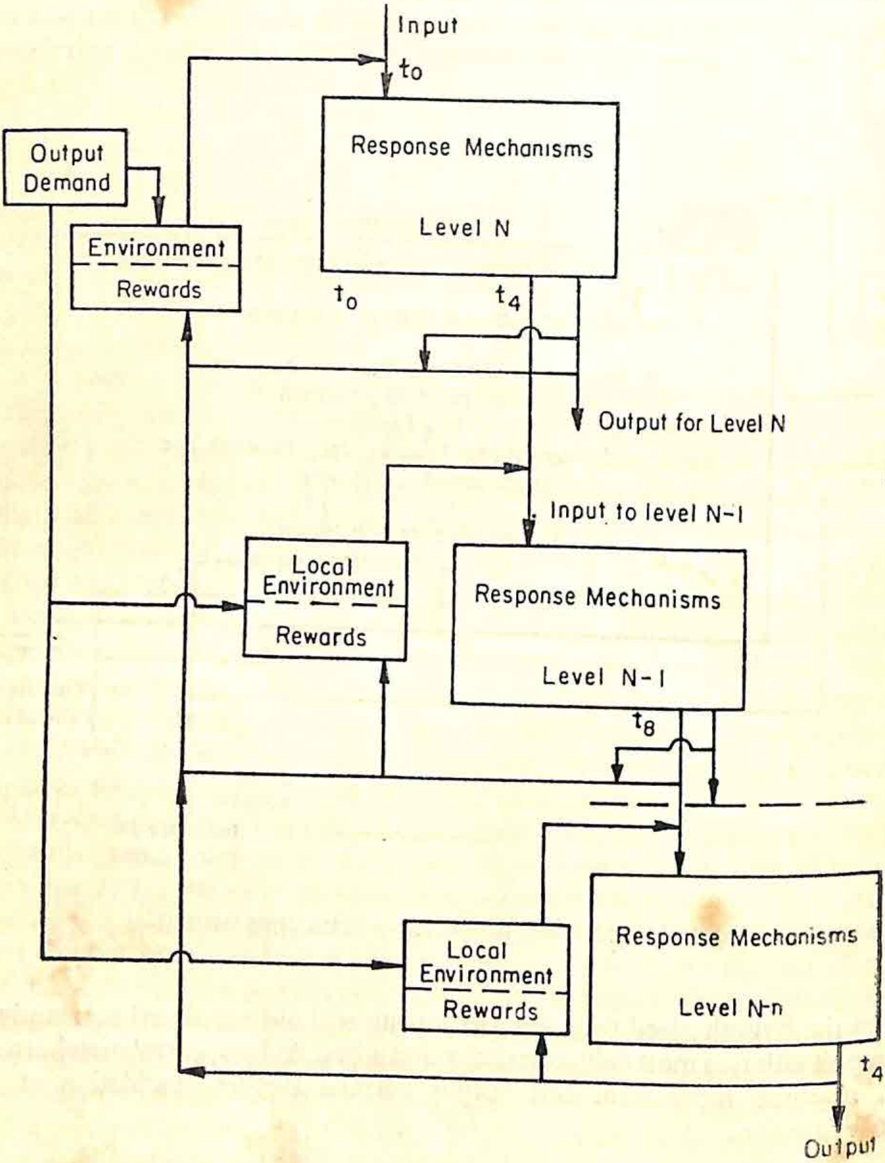


FIGURE 2: GENERAL MULTILEVEL RESPONSE-MECHANISM MODEL

within one operating division of the line organization where sensing, power and control accessories were overhauled and tested. The shops ranged in size from 12 to 30 employees and processed relatively homogenous types of equipment, such as flight instruments, each having many sub-types. Each shop had a supervisor who reported to a section head. Several sections grouped together constituted a branch and several branches were grouped together into a division. Data were collected from shop workers, shop supervisors, section and branch heads.

In assigning shops to experimental or control status, they were matched by type of work, style of supervision, worker skills and past performance.

Some 50 to 50 generic types of products, each having up to 100 sub-types differing in construction and complexity, were overhauled in the study shops. Not all of the product types and sub-types were processed at any one time.

B. Experimental Treatments

The primary hypothesis specified two modifications in a supervisor's job by assigning to him:

1. Responsibility for all functions required to complete each product.
2. Authority for final product quality acceptance.

The treatments introduced moved the shops through three organizational states, from functional organization of process (initial state) to complete process or product organization with external quality control (second state) and finally to full product responsibility (third state). The difference between the first and second states were technically complex and required the acquisition of additional knowledge and skills on the part of supervisor and workers. The tasks added in the third state were largely replicative and technically only trivially different from those of the second state; the major difference being in status and authority to perform quality acceptance. The three organizational states are schematically represented in Figures 3, 4, 5.

To evaluate the first modification of the supervisor's job, referred to as the Product Responsibility Treatment, two experimental and two comparison shops were selected. The experimental shops moved from State I to State II while the comparison shops operated continuously in State II. The change in task contents of the shops and hence of the supervisor can be seen by comparing Figures 3 and 4.

The second modification of the supervisor's job stated in the primary hypothesis, called the Quality Responsibility Treatment, involved withdrawing quality control inspectors and transferring their product acceptance authority to the shop supervisors. Four experimental and three control shops participated in this test. All seven shops had operated in State II before introduction of the change. The job design modification moved the experimental shops into organization State III while the control shops remained in State II. The task contents of the supervisor's job in State III are shown in Figure 5.

C. Study Period

The study was conducted over a period of 15 months. During the first 9 months, referred to as the pre-change period or period-I, data were collected on all of the criterion variables for the operation of the 11 selected shops in their

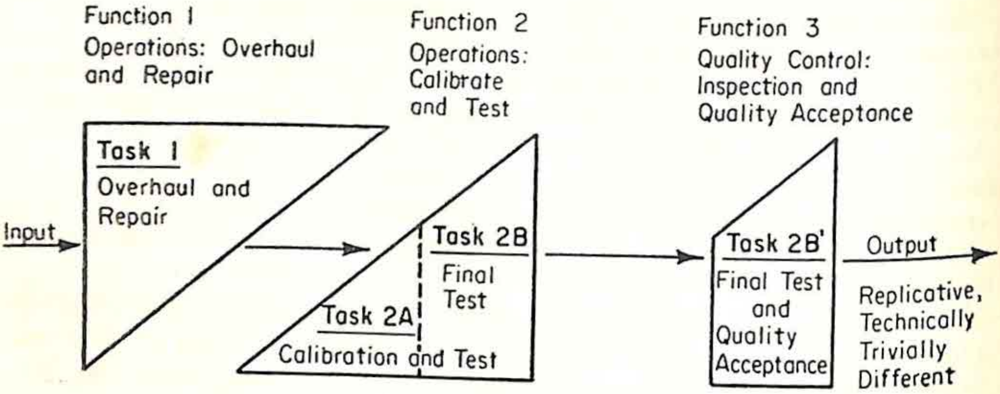

Function 1
Operations: Overhaul and Repair
Function 2
Operations: Calibrate and Test
Function 3
Quality Control: Inspection and Quality Acceptance
Task 1
Overhaul and Repair
Input
Task 2B
Final Test
Task 2A
Calibration and Test
Task 2B'
Final Test and Quality Acceptance
Output
Replicative, Technically Trivially Different

FIGURE 3: ORGANIZATION STATE I:
TASK CONTENTS OF WORK FUNCTIONS FOR FUNCTIONAL ORGANIZATION OF PROCESS

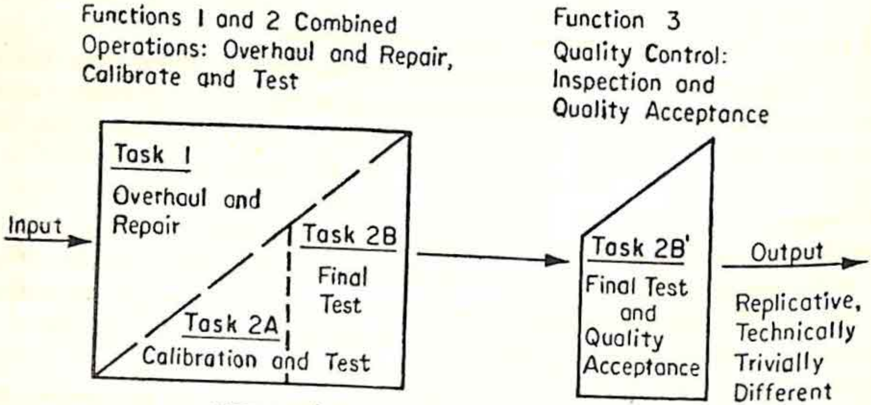

Functions 1 and 2 Combined
Operations: Overhaul and Repair, Calibrate and Test
Function 3
Quality Control: Inspection and Quality Acceptance
Task 1
Overhaul and Repair
Input
Task 2B
Final Test
Task 2A
Calibration and Test
Task 2B'
Final Test and Quality Acceptance
Output
Replicative, Technically Trivially Different

FIGURE 4: ORGANIZATION STATE II:
TASK CONTENTS OF WORK FUNCTIONS FOR
PRODUCT ORGANIZATION WITH EXTERNAL QUALITY CONTROL

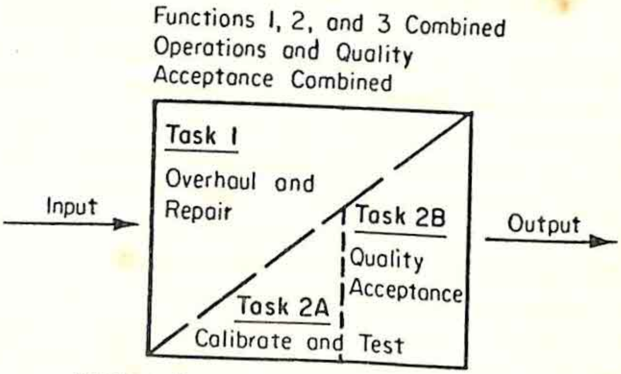


FIGURE 5: ORGANIZATION STATE III:
TASK CONTENTS OF WORK FUNCTIONS FOR
PRODUCT-CONTROL ORGANIZATION INCLUDING QUALITY RESPONSIBILITY

original or initial state. The experimental treatments, outlined below, were introduced into the 6 experimental shops at the end of this period and data on objective criteria were collected for another 6 months; data on intervening criteria continued to be collected for 15 months after the treatments were introduced. The second period is referred to as the post-change period or period-II.

D. *Measures of Performance and Behavior* (*Criteria*)

This study in dealing with an organizational input-output system and the intervening response mechanism of its members must account for changes in absolute criterion measures (ratio scaled) as well as those of relative character (ordinal scaled). The former deal with the direct and indirect costs accruing to an organization and are usually used by organizations to evaluate performance. The latter criteria have been hypothesized as reflecting some of the mediating or intervening effects of the experimental treatments which eventually may result in "output" effects. In future studies these relative measures may assume a more central role in serving as predictors of output measures, and hence as job design selector guides. These criteria were selected in the attempt to develop a comprehensive cost criterion by which it is hoped eventually to measure the total inputs and outputs of an organization. Data to evaluate the intervening responses to the treatments were gathered from questionnaires, interviews and by direct observation.

E. *Environmental Factors*

The study organization was subjected to pressures from privately owned companies seeking to acquire the work done by such military industrial facilities. This led to national and local policy on costs of operation. The stated policy of the organization's top management was to minimize costs in order to remain competitive. This was an article of faith repeatedly emphasized to all employees at all levels. Everyone in the organization knew, however, that top management had only partial control over operating costs since labor force size was in part determined by external policy decisions.

As a part of the defense industries complex the organization saw as one of its major peacetime raisons d'être the maintenance of a dependable core industrial system for potential emergency expansion. This requires a good physical plant and a highly skilled labor force. Availability of workers with skills of limited national supply was of special concern. Most of the employees in the study shops were in this category.

Over the years maintenance of a balanced and skilled labor force for purposes both of competing with other similar military industrial facilities and for emergency readiness was seen by all as an implicit management goal. Most of the organization's members, in fact, believed that the goal of minimizing operating costs had a lower priority than the goal of manpower resource maintenance. Thus there existed a conflict between the stated and the implicit operating policies in the organization. The general acceptance of the implicit goal led to an essentially man-oriented organization with lip service given to cost minimization.

A second source of conflict with stated policy appeared to have been the application of "lump of work" theory. Employees and supervisors saw the total demand for repair of certain existing government owned equipment as fixed. Greater work efficiency therefore would reduce the number of required employees. In-plant transfer of workers to less desirable positions and possible lay-offs could be avoided by gearing work pace to fluctuating demands. Supervisors implicitly supported this strategy to maintain their status and to retain their skilled personnel. Workers assigned to prestige shops preferred to retain their desirable positions Thus, both supervisors and workers seemed to perceive organizational stability as their own and the organization's real goal.

IV: RESULTS

A. Output Variables

The output responses to the treatments measured by objective criteria are presented in summary form here. They have been presented and discussed in detail elsewhere (Davis, Valfer & Pool, 1964; Valfer, 1964; Davis & Valfer, 1965). The objective criteria for evaluating the primary hypothesis include productivity, direct cost of production (labor and materials), quality, and personnel costs. A summary of the changes predicted by the hypothesis versus those achieved, in terms of these criteria follows:

Predicted Changes	*Achieved Changes (By Treatment)*	
	Product Responsibility	*Quality Responsibility*
1. Lower Costs	No Change	Significant Improvement
2. Higher Quality	Significant Improvement	Improvement Trend
3. Higher Productivity (Output)	No Change	No Change
4. Lower Personnel Costs	No Change	No Change

Lower direct operating costs (including labor and material costs to correct defects) were obtained in the Quality Responsibility but not in the Product Responsibility Treatment shop group. As indicated earlier the Quality Responsibility treatment was a relatively simple technical change as compared to the Product Responsibility treatment. Adjustment to the change by supervisors and workers took place in the Quality Responsibility shops by the end of the data collection period and was still in a transient state in the Product Responsibility shops.

During the study quality standards were raised by the supervisors of the Quality Responsibility shops as a hedge against failure to meet the added responsibility imposed by their new authority to accept finished products. Since quality improvement was measured by number and cost of rejects, raising standards in the Quality Responsibility experimental shops tended to mask change in this response measure. However, reduction in total costs did take place even with the higher quality standards.

Productivity remained unchanged for both treatments. This may be seen as the response of supervisors and workers to satisfying their real goal of organizational stability, i.e., maintenance of constant manpower resources. However, for the Quality Responsibility shops operating costs were lowered. The organization's positive response to the treatment in the form of lowered total operating costs may be seen as the only non-threatening response available given the real goals held.

Personnel costs in terms of absenteeism, lateness, grievances, transfers, injuries, etc. were not significantly affected by the treatments. It may be possible that the study period was not sufficiently long to affect these costs which were markedly low in the organization both before and after introduction of the treatments.

B. Intervening Variables

The response-mechanism model postulated that changes in a supervisor's performance as a consequence of changes in his job (input to output flow) result via mediating changes in his perceptions, attitudes, and motivations producing changes in behavior toward others and tasks. Measurement of perceptions and attitudes are necessary furthermore because they are direct indicators of the participant's need satisfactions.

Changes in attitudes, perceptions and behavior toward others were measured by interviews and questionnaires. Changes in supervisor's behavior toward tasks were measured by random activity sampling and job content inventory with time allocation estimates.

The predicted changes were stated in a series of intervening hypotheses. For the Product Responsibility treatment, 72 intervening hypotheses were postulated; 33 were supported (3 significantly, the remainder qualitatively). For the Quality Responsibility treatment 69 hypotheses were postulated of which 34 were supported (18 significantly, the other 16 qualitatively) (Davis, Valfer & Pool, 1964). The significant hypotheses are not listed in this paper, but can be inferred from the variables in Tables 3 and 4.

1. Supervisor's Task Selection and Time Allocation

Work sampling data and task inventory with time estimates were collected from the supervisors of all 11 participating shops. Transfers of supervisors during the study reduced the available data to only 8 complete sets. The work sample size was set to provide a confidence level of 90%±10% accuracy. The significant changes in supervisor's time allocation to his various tasks are given in Table 1. Supervisors' estimates of their daily task distribution are summarized in Table 2, which also shows the significant changes attributable to the treatments.

All changes in supervisors' time allocation to tasks that took place were predicted with the exception of (1) supervisors under both experimental treatments did not spend more time with design engineers; (2) additionally the Product Responsibility supervisors did not increase their time allocation to consultation

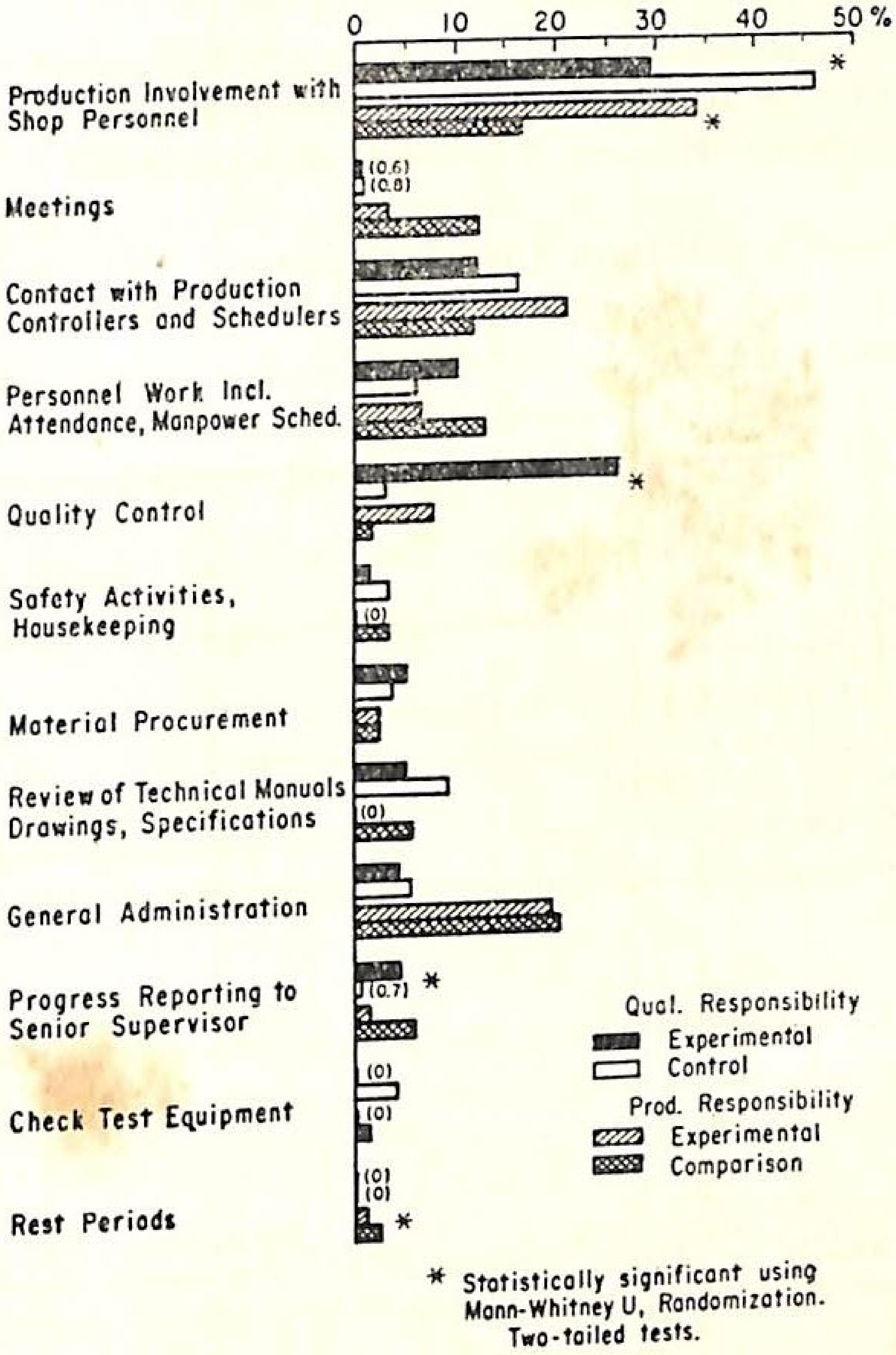
TABLE 1: SIGNIFICANT CHANGES IN SUPERVISOR'S TIME ALLOCATION

Experimental Variables	Shops	Levels of Significance	Face-to-Face Communication about or with					Inspection	Paper-work+ Phone	Non-Overt Activity	Meetings	Breaks, Travel, Unavailable
			Subordinates	Other Supervisors	Higher Level Supervisors	Other	Control Center					
Quality Responsibility	Expm'tl (4 shops)	.10						↑		↓		
		.05										
		.01			↑			↑		↓		
	Control (2 shops)	.10									↓	
		.05				↑ ↑ (05)						
		.01							↓	↓ ↓		↓ ↓
Product Responsibility	Expm'tl (1 shop)	.10							↑			
		.05										
		.01		↓						↑		
	Comparison (1 shop)	.10										
		.05										
		.01		↓						↑		

Code: ↑ = Significant increase in % Time Allocation to an Activity from pre- to post-change period per supervisor.
↓ = Significant decrease in % Time Allocation to an Activity from pre- to post-change period per supervisor.
Significance tested by x^2 with 7 d.f.

with planners nor decrease the time they spent on quality problems. The shifts in time allocation indicated greater involvement of supervisors with shop personnel on technical management rather than personnel management problems, increased emphasis on their own technological job content such as quality and cost control and less dependence on other supervisors or superiors. The sum of all the time allocation changes suggest the development of more technically oriented, autonomous supervisors having less free time available.

TABLE 2: SUPERVISOR'S JOB CONTENT LISTING
Mean Daily Sum of Tasks in Percent of Total Day's Work



2. Perceptions and Attitudes

a. Supervisors' Questionnaires

Four questionnaires were given to first-line supervisors prior to and after the introduction of the treatments to measure changes in attitudes, perceptions and orientation which might have resulted from the experimental treatments. The questionnaires were: (1) Supervisor's Questionnaire, constructed to elicit perceptions about job content, organization structure, self-utilization and work values, was similar to the Worker's Questionnaire; (2) LBDQ[1] and (3) LOQ[2] which measured two dimensions, Initiation of Structure and Consideration; and (4) RAD[3] Questionnaire which measured three dimensions, Responsibility, Authority and Delegation. Transfers of supervisors reduced the pre-change to post-change data available for supervisors from 11 to 7, a sample sufficient only for qualitative estimates of significant changes. The full sample size of 11 supervisors was used to compare responses between experimental and control shops during the post-change, period-II, evaluation.

The small sample size limited statistical significance of differences test levels to 0.13 for the Quality Responsibility Shops during periods II-I evaluation, and to qualitative indicators for the Product Responsibility Shops during periods II-I and period-II evaluation. During the period-II the questionnaire given to the first-line supervisors also contained 12 dimensions from the Ghiselli[5] and Porter[6] scales. Table 3 gives the comparisons for periods II-I and Table 4 gives the comparisons for post-change period-II only.

b. Higher Level Supervisors' Questionnaires

During periods I and II, second and third level supervisors were given the LBDQ questionnaire and rated their own first-line supervisors and their corresponding shops for effectiveness and performance. Significant differences in the ratings and LBDQ responses from higher level supervisors are also shown in Table 3.

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[1] LBDQ=Leader Behavior Description Questionnaire, Bureau of Business Research, Ohio State University, Columbus, Ohio.

[2] LOQ=Leader Opion Questionnaire, Science Research Associates, Chicago, Illinois.

[3] RAD=Responsibility, Authority, Delegation Questionnaire, Bureau of Business Research, Ohio State University, Columbus, Ohio.

[5] Ghiselli, E. E. "Self Description Inventory", University of California, Berkeley, 1958.

[6] Porter, L. W. "Management Position Questionnaire", University of California Press, Berkeley, 1960.

TABLE 3: CHARACTERISTICS AND BEHAVIORS OF FIRST LEVEL SUPERVISORS

Showing the group (E) experimental or (C) control which changed most from pre to post-experimental period

Characteristics	*Evaluated By*	*Evaluation*(1) *Instrument*	*Quality*(2) *Responsibility Shops*	*Product Responsibility Shops*
1. Initiating Structure**	Workers	LBDQ	E*	C†
2. Initiating Structure	Self	LBDQ		C†
3. Consideration	Workers	LBDQ		C†
4. Consideration	3rd Level Superv.	LBDQ	C*	
5. Ratings of individual	2nd Level Superv.	SE	E*	
6. Effectiveness of 1st level Supervisors	3rd Level Superv.	SE	E*	E†
7. Degree of responsibility in job	Self	RAD		C†
8. Delegation of job	Self	RAD	C*	C†
9. Time spent by 1st level supervisor on output problems	Self	SQ	E†	C†
10. Time spent alone by 1st Level Supervisor	Self	SQ		E†

11. Time contacting shop personnel	Self	SQ	E†	
12. Time on technical problems with workers	Self	SQ	E†	E†
13. Time on personnel problems with workers	Self	SQ		E†
14. Miscellaneous time with shop personnel	Self	SQ	C†	C†
15. Number of contacts with workers per week	Self	SQ		E†
16. Time on production problem solving with shop personnel	Self	SQ	E†	
17. Time on reviewing—quantity of output	Self	SQ		C†
18. Time on managing—quality of output	Self	SQ		C†
19. Time on quality instruction of workers	Self	SQ		C†
20. Miscellaneous activities—technical	Self	SQ		E†
21. Time with 2nd and 3rd level Supervisor on output problems	Self	SQ		E†
22. Time with 2nd and 3rd level Superv. on improving quality	Self	SQ		E†
23. Time with 2nd and 3rd level Superv. on personnel problems	Self	SQ		C†
24. Time with Design Engineers on technical problems	Self	SQ	C†	
25. Number of tasks giving very high degree of satisfaction	Self	SQ	E†	
26. Number of tasks giving mildly high satisfaction	Self	SQ	E†	
27. Contribution by Superv. to quality vs. Design Engr.	Self	SQ		C†
28. View of inspector's role: Consultant rather than specification setter	Self	SQ	C†	E†
29. View of inspector's role: Consultant rather than obstructor of shop operations	Self	SQ		E†
30. View of inspector's role: specification setter rather than obstructor of shop operations	Self	SQ	C†	E†
31. Number of suggestions developed outside of working hours	Self	SQ	E†	

** In Quality Responsibility Shops there was a relative gain in Initiating Structure scores for Experimental Shops compared with Control Shops (0.13 L.S.). In Product Responsibility Shops there was a relative loss in Initiating Structure for Experimental compared with Comparison Shops.

(1) Instrument:
LBDQ: Leader Behaviour Description Questionnaire, Ohio State University.
RAD: Responsibility, Authority, Delegation Questionnaire, Ohio State University.
SQ: Supervisors' Questionnaire.
SE: Higher Level Supervisors' Evaluation.

(2) Experimental (E) or Control (C) Supervisory Group having higher evaluation for the characteristic at the following level of significance:

Two-tailed Randomization and Fisher's Exact Probability Tests

* 0.13 level of significance (highest discriminator possible for sample size).

† Sample too small for statistical test, but there appears to be a trend.

TABLE 4: CHARACTERISTICS AND BEHAVIORS OF FIRST LEVEL SUPERVISORS

Showing the group (E) experimental or (C) control whose supervisor had the higher self-evaluation during the post-experimental period only.

Characteristics	*Evaluation*(1) *Instrument*	*Quality* (2) *Responsibility Shops*	*Product Responsibility Shops*
1. Intelligence	Ghiselli	E*****	
2. Esteem (discrepancy bet. what is and should be)	Porter	C*****	
3. Autonomy (importance of)	Porter	C*****	
4. Information flow	Porter		
a. How much is there			E†
b. How much should there be		C*	
c. How important is this		C*	
d. Discrepancy bet. should be and is		C*	
5. Pressure on you	Porter		
a. How much should there be			C†
b. How important is this to you			C†
6. Time spent by supervisor on output problems	SQ	E**	
7. Time spent by supervisor on personnel problems	SQ		C†
8. Time spent by supervisor on all tech. activities other than quality	SQ		E†
9. Time spent by supervisor on quantity instructions to workers	SQ	E**	E†
10. Time spent by supervisor on quality output problems	SQ		C†
11. Time spent by supervisor on quality instructions	SQ		C†
12. Time spent by supervisor on quality review	SQ	E**	
13. Time spent by supervisor with Design Engrs. on tech. problems	SQ	C****	
14. Time spent by supervisor with planning group	SQ	E**	
15. How much authority does supervisor have	SQ		E†
16. Number of tasks giving very high satisfaction	SQ	C**	
17. Number of tasks giving moderate dissatisfaction	SQ	E**	
18. Supervisor's involvement with products	SQ		E†
19. Perceived degree of worker participation in planning	SQ		E†
20. Perceived reduced enforcement of routines	LBDQ	E*****	
21. Perceived criticizing of subordinates	LBDQ		C†
22. Perceived support of subordinates	LBDQ		C†
23. Perceived interest to try out own ideas	LOQ		C†
24. Perceived receptivity to change	LOQ		E†

(1) Instrument:

Ghiselli: Self Description Inventory, University of California, Berkeley.
Porter: Management Position Questionnaire, University of California, Berkeley.
LBDQ: Leader Behaviour Description Questionnaire, Ohio State University.
SQ: Supervisors' Questionnaire.
LOQ: Leader Opinion Questionnaire, Science Research Associates.

(2) Level of Significance: Two-tailed Randomization and Fisher's Exact Probability Tests.
* 13%; *** 10%; ***** 5%;
** 11%; **** 6%; † Qualitative Indication of possible Signif. trend.

c. Workers' Questionnaires

During periods I and II, workers evaluated their supervisors on the LBDQ questionnaire and their own jobs and roles in the organization by specially designed Worker and Job Design questionnaires. During period II, the Porter and Ghiselli scales were added to the Job Design questionnaire. Significant differences in workers' responses to the LBDQ questionnaire are given in Table 3, items 1 and 3.

d. Interviews

A further exploration of the attitudes and perceptions related to the experimental treatments was undertaken for the members of all groups participating in the study through a series of interviews conducted towards the end and after the close of the post-change period. The responses to the partially structured interviews essentially supported the findings of the supervisor and worker questionnaires and also revealed the problem of goal conflict. The interview responses are treated in detail in the primary reports of the study (Davis, Valfer & Pool, 1964; Valfer, 1964).

e. Incomplete Exploration

The data collection period lasted 15 months. Full adjustment and stabilization to the treatments had not taken place at the end of the 6 month post-change period. There were indications that attitudes and perceptions of workers and supervisors were still changing as they experienced and tested their roles modified by their new job designs. Likert (1961) has suggested that an average time span of two years is required to attain a steady state after job or other organizational changes have been introduced. This estimate was based primarily on single level treatments. Multiple level treatments, as introduced in this study, may be expected to require longer adjustment time. Longer term field studies may be necessary to more fully explore the rates of adjustment to such organizational changes.

f. Summary of Changes in Perceptions and Attitudes

The most significant changes in perceptions and attitudes for all of the participants in the experimental treatments are summarized in Table 5. These are:

1. The most significant changes in supervisors' perceptions and attitudes was recognition of greater autonomy as a consequence of both treatments. The interviews supported this shift in perception and suggested that this was a major source of stimulation for the supervisors towards more effective shop management.
2. Reduced time available for personnel management was suggested by the supervisors as the greatest negative feature of both treatments; it was differentially more pronounced in the Quality Responsibility treatment shops.
3. Overall attitudes among first level and higher level supervisors were favorable towards both treatments. For first-line supervisors, greatest treatment support came from those who were technically oriented and exposed to the low complexity treatment. Next highest support came from supervisors of the high complexity treatment group, and lowest support came from the man-oriented

TABLE 5: SUMMARY OF CHANGES IN ATTITUDES AND PERCEPTIONS

Treatment	*Level*	*Perceptions & Attitudes*	
		Favorable	*Unfavorable*
Product Responsibility (High Technical Complexity)	Supervisor	1. Less reigid internal structure 2. More contacts with shop personnel 3. More contacts with higher supervision 4. Greater autonomy 5. Greater technical orientation 6. Better product control	1. Less responsibility 2. Less delegation 3. Less man-orientation 4. Slow shift of responsibility to worker level
	Workers	1. Less rigid internal structure 2. More responsibility	1. Less consideration by supervisor 2. More pressure for lower costs
Quality Responsibility (Low Technical Complexity)	Supervisor	1. Greater satisfaction with job tasks 2. Greater involvement in job 3. Greater information flow to workers 4. More authority 5. More technical orientation 6. Less conflicts with staff groups	1. Less man-orientation 2. Less delegation
	Workers	1. Greater job responsibility 2. Less pressure for lower costs 3. More functional responsibilities 4. More frequent praise by supervisor 5. Greater influence on shop operations	1. Greater internal structure 2. Less work improvement effort 3. Greater emphasis on extrinsic job values

supervisors of the low complexity treatment group. This suggests that support for the treatments may have been a function both of reinforcement of preferred style of supervision, and of complexity of treatment with the heavier loading placed on the former.

4. Workers' responses to the treatments were directly related to the degree to which supervisors transferred to workers the responsibility and authority indicated in the treatments. In the low complexity treatment (Quality Responsibility) transfer of responsibilities took place rapidly and workers responsed favorably. In the high complexity treatment (Product Responsibility), little task transfer took place during the early post-change period. Workers' attitudes tended to be indifferent towards the treatment.

5. Intrinsic and extrinsic job content values for workers were positively correlated and increased as a consequence of the low complexity treatment (Quality Responsibility).

6. Initiating Structure and Consideration dimensions were positively correlated. They increased in the low complexity (Quality Responsibility) treatment and decreased in the high complexity (Product Responsibility) treatment groups. The change in these dimensions was the most significant change perceived by workers. The direction of response may be a reflection of the difficulties experienced by supervisors in adjusting to changes in their jobs, and in re-establishing equilibrium between their responsibilities and authority and those of their workers. The positive correlation between Initiating Structure and Consideration may indicate, contrary to accepted theory, that some Initiating Structure may be helpful to an organization and its members

7. Response direction indicating motivation towards change was dependent upon (1) the individual's needs and goals, and (2) congruence of individual and organizational goals. Reasonable consistency was expected and obtained within the sample population on these two definers.

g. Perceptions and Attitudes: Overview

Supervisors in both treatment shop groups, after scattered initial scepticism, and even opposition, responded with mild to vigorous support and enthusiasm for the organization changes. The workers in the Quality Responsibility experimental shops generally expressed satisfaction with their new situation and the consequent effects on their jobs. In the Product Responsibility experimental shops, the adjustment to the change by the supervisors was so slow that at the worker level only minor job changes such as rotation of personnel between repair and testing had been effected at the conclusion of the study. Worker attitudes toward this treatment remained relatively neutral.

In order of increased personal need satisfaction, the smallest increase was reported by Product Responsibility workers, followed by Product Responsibility supervisors, then by Quality Responsibility workers with Quality Responsibility supervisors reporting the most pronounced increase.

Some increases in objective criteria measures have already been noted. The response-mechanism model proposed that favorable changes in perceptions and attitudes will lead, in time, to positive output changes. Some increase in output measures have already been noted. The generally favorable changes in perception and attitudes strongly suggest that, given more time, increasingly favorable responses in the objective output measures will become apparent until a steady state is reached. The Product Responsibility Treatment, because of its complexity, can be expected to reach a steady state condition later than the Quality Responsibility Treatment.

V: CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

In this study some supervisory jobs were redesigned to enlarge their responsibility for product completion and others to enlarge their authority to include product quality acceptance. Results of these shifts in responsibility for and authority over work functions were:

1. Changes in Objective Criteria

Criteria	*Product Responsibility*	*Quality Responsibility*
Treatment Complexity:	High	Low
(a) Environmentally Supported:		
(1) Quality	Improved	No Significant Change but Favorable Trend
(2) Costs	No Change	Improved
(b) Environmentally Not Supported:		
(1) Productivity	No Change	No Change

Those performances improved that were supported by the organizational environment, i.e. that avoided goal conflicts for the supervisor and did not threaten achievement of the supervisor's implicit goals which were perceived by him to be the real goals of the organization. Improvement was also a function of job change complexity, responding first to low complexity changes. Given the conflict between stated and implicit goals in the organization, the treatments did in fact achieve positive changes in compatible objective criteria.

2. Supervisors exhibited greater degrees of autonomy and indicated greater overall personal need satisfaction as consequences of both treatments. This was also seen by the workers. These behavior and satisfaction changes would seem to contribute to an organization's viability.

3. Both treatments resulted in a shift of supervisors' time from man-management to technical-management. Workers responded positively to this change in management style. The treatments allowed better technical control and decision making by supervisors through shortened feed-back loops and product queues as well as concentration of functional authority.

4. A hypothesized response-mechanism model explained the mediating response flow from job change input to performance output. Because of the favorable attitudes of supervisors and workers to the treatments, the response-mechanism model suggests that further improvement in output criteria can be expected when the system reaches a steady state.

B. Recommendations

1. For Job Design

a. Where technically feasible, the design of a supervisor's job should be in the direction of including authority and responsibility over all the functions required to complete the product or service assigned to his work group, including quality acceptance.

b. Based on the results of this and previous studies, responsibility and authority for work functions should be delegated to the lowest organizational level performing the work.

2. For Future Studies

a. The treatments introduced in this and other reported studies are not exhaustive for the worker population and have merely begun to systematically explore supervisory job design rules. Additional treatments have been suggested by Davis (1957). These still need to be experimentally tested.

b. Further exploration is required of the transfer effect of job design changes from one level of an organization to another, i.e. predicting and evaluating the effects of job changes at one level on levels above and below.

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"... All Except ...". Definition by Exclusion, Relative Class Complexity and S-R Compatibility in Dichotomous Classification Tasks

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If a family of items is divided into two mutually exclusive classes it is economical to define the more complex class in terms of the less complex one. For this reason definition by exclusion is used frequently to reduce the load on memory and to save words in conveying information. When incorporated in an instruction, however, definition by exclusion had an adverse effect on performance at a classifying task, except when the disparity between the complexity of the two classes was large. The difficulties associated with instructions utilizing definition by exclusion were considered to be due to (a) failure to enumerate the items to which the subject must respond and (b) high S-R incompatibility. Some evidence for the effects of S-R compatibility was found in a second experiment.

INTRODUCTION

If a family of items is divided into two mutually exclusive classes, A and B, each class can be defined exactly either by reference to all the items it contains, definition by inclusion, or by reference to all the items it does not contain, definition by exclusion. Thus an item from Class A can be classified correctly either by deciding that it is a member of Class A, or by deciding that it is not a member of Class B and must, therefore, be a member of Class A. In a previous paper Shepherd (1964), concerned with the relationship between class complexity and performance, it was argued that when responding only to the items from one of two classes performance is a function of the complexity of the class searched for, other factors remaining constant. This applies only when the class of items searched for is the same as the class of items to which a response is made. There are situations, however, in which it appears to be convenient to search for the items in one class but to respond to the items from the other class. It was proposed that the relative complexity of the two classes was one of the main factors affecting both preferences for these alternative methods of classification and the speed and accuracy of performance associated with them. These alternatives lead to two forms of instruction in which the class of items to be responded to is defined either by 'inclusion' or by 'exclusion.'

With only two classes it is economical to define the more complex in terms of the less complex class since it is easier to remember the composition of the simpler one. For example, the consonants are more easily defined as 'all the letters except a, e, i, o and u' rather than by reference to the twenty one letters which are consonants. This method of definition assumes that the reader knows all the items in the domain, in this case the letters of the alphabet. Thus definition by exclusion is used frequently to reduce memory load and to save words in conveying information. When incorporated in instructions, however, it might cause difficulties. For example, in a cancelling task the instruction 'Cancel all letters of the alphabet except a, e, i, o and u,' entails the subject searching for one class, the vowels, but responding to the other class, the consonants. It seems more natural, however, to respond to the items searched for when they are found.

Wallach (1959) investigating subjects' use of classes defined by inclusion and exclusion found that inclusive definitions were preferable and suggests a number of possible explanations for the difficulties associated with the use of definition by exclusion. Thus, while definition by exclusion provides an economical method of conveying information it may cause difficulties when used in instructions.

The following experiment was designed to assess both preferences and optimal method of instruction, as judged by performance in a classification task, in various situations where the benefits of definition in terms of the least complex class and of definition by inclusion are in conflict. These situations were produced and manipulated by varying the relative complexity of the two classes.

METHOD

For the purpose of this experiment the 'complexity' of a class is defined in terms of the number of discriminably different members included within it. The 'relative class complexity,' or ratio, of two classes is the number of members in the smaller class to the number of members in the larger class.

As the ratio of the complexity of two classes approaches unity any advantages of definition by exclusion should diminish. At some ratio less than unity the advantages of definition in terms of the less complex class should be balanced by the disadvantages of definition by exclusion. These considerations only apply when a response is to be made to the members of one class but not to members of the other since if both classes are associated with their own response the instructions can always be transformed in such a way as to allow the subject to work in terms of the least complex class defined by inclusion.

The digits 0 to 9 were used as items and arbitrarily divided into two classes. The relative complexity of the classes was varied by using two ratios. A ratio of two digits to eight digits (2:8) was chosen because of the large disparity in complexity between the classes and a ratio of four digits to six digits (4:6) because although the disparity was less there was still some economy to be obtained from definition in terms of the least complex class. A cancelling-type task was used in which subjects were asked to respond to one of the two classes of digits, defined either by inclusion or by exclusion. Three forms of instruction were studied, for example: (A) Tick the numbers 0, 1, 2, 4, 5, 6, 8 and 9; (B) Tick all numbers except 3 and 7; and (C) Tick the numbers 3 and 7. If subjects disliked the (A) form of instruction which involved an uneconomical definition in terms of the more complex class they could translate it into the (B) form. Similarly if subjects disliked the (B) form of instruction involving definition by exclusion they could translate it into the (A) form. With the (C) instruction there is no conflict between definition by inclusion and definition in terms of the least complex class. In the (B) and (C) instructions the subject's attention is directed toward the same class of digits, the less complex class, but he is required to respond to different classes, in the former to the more complex class and in the latter to the less complex class. In the (A) and (B) instructions subjects are required to respond to the same class, the more complex one, but their attention is directed toward different classes, in the former toward the more complex class and in the latter toward the less complex class.

Materials, Procedure and Subjects

The task material consisted of the digits 0 to 9 typed on quarto sheets 1 cm. apart in twelve rows each of twelve digits and with 1.4 cm. between rows. The total task comprised eight sheets.

The ten digits were divided into two arbitrary classes of digits of size two and eight digits for half the subjects and four and six digits for the other half. Subjects were asked to respond to only one of the classes. The proportion of digits requiring a response on each sheet was exactly half. The frequency of occurrence of each digit was adjusted so that all digits in the same class occurred equally often. The digits were placed randomly on the sheet and each sheet was compiled independently.

Subjects were asked to work as quickly as possible consistent with accuracy and were told not to correct mistakes. They had half a minute rest pause between sheets. The time taken to classify each sheet of digits was recorded with a stopwatch. At the end of the task subjects were questioned about the digits they had searched for and the way in which they had performed the task. The specific instructions at the two ratios were as follows:

	Instruction	Group 1 Ratio 2:8	Group 2 Ratio 4:6
A	Tick the numbers	0, 1, 2, 4, 5, 6, 8 & 9	0, 2, 3, 6, 7, & 9
B	Tick all numbers except	3 & 7	1, 4, 5 & 8
C	Tick the numbers	3 & 7	1, 4, 5 & 8

The thirty-six subjects were students of psychology of both sexes. They were allocated at random to the instruction groups.

RESULTS

The preferences shown for different forms of instruction and the performance data are considered separately. Briefly, the subjects preferred instructions involving definition of the least complex class at the 2:8 ratio, even when this entailed definition by exclusion, whereas at the 4:6 ratio the preference, although less clear cut, was for definition of the more complex class. With regard to performance, this followed the form of instruction actually used by the subject. Thus, at the 2:8 ratio, performance with instructions A and B was similar and worse than with C. At the 4:6 ratio performance with instruction B was worse than with either A or C while the latter instructions resulted in fairly similar performance.

TABLE 1: THE NUMBER OF SUBJECTS WHO SEARCHED FOR THE MORE OR THE LESS COMPLEX CLASS OF DIGITS IN EACH GROUP

Instruction Ratio 2:8	Class enumerated	Class searched for	
		Less complex	More complex
A	More complex	6	0
B	Less complex	6	0
C	Less complex	6	0
Ratio 4:6			
A	More complex	0	6
B	Less complex	6	(4)
C	Less complex	6	0

TABLE 2: THE MEAN TIME TAKEN PER TRIAL IN SECONDS. THE STANDARD DEVIATION (S.D.) IS SHOWN IN BRACKETS

Instruction Ratio 2:8		Trial							
		1	2	3	4	5	6	7	8
A	Time	71.9	61.0	56.1	55.7	53.8	52.3	55.0	55.6
	S.D.	(14.2)	(10.0)	(6.4)	(4.0)	(4.9)	(5.5)	(3.8)	(6.1)
B	Time	56.3	57.2	60.1	60.5	56.8	58.3	60.7	59.4
	S.D.	(9.2)	(10.2)	(7.7)	(8.4)	(10.2)	(12.5)	(11.1)	(9.5)
C	Time	43.1	40.1	39.9	39.0	39.8	38.8	37.3	38.0
	S.D.	(11.2)	(9.6)	(12.1)	(10.1)	(10.3)	(9.1)	(8.7)	(8.9)
Ratio 4:6		1	2	3	4	5	6	7	8
A	Time	67.4	59.7	60.2	59.6	58.9	55.4	54.5	56.3
	S.D.	(7.6)	(8.3)	(12.6)	(7.3)	(9.8)	(7.6)	(6.6)	(9.7)
B	Time	101.7	90.7	83.4	80.4	86.3	83.6	78.6	86.6
	S.D.	(18.8)	(16.7)	(12.0)	(14.4)	(16.5)	(15.2)	(15.1)	(22.6)
C	Time	60.9	55.7	55.0	53.3	52.7	51.0	51.9	52.6
	S.D.	(10.5)	(6.6)	(8.3)	(7.4)	(9.0)	(5.5)	(6.5)	(6.8)

Preferences

Although the class to which they must respond was fixed subjects could choose which class they would attend to, i.e., which digits they would search for. These preferences are shown in Table 1. With the A instruction, in which the more complex class was enumerated, all subjects reported that they had reformulated the instruction at the 2:8 ratio and searched for the digits in the less complex class. At the 4:6 ratio, however, all subjects searched for the digits in the more complex class, as specified in the instruction.

With the B instruction, in which the more complex class was defined by exclusion, at the 2:8 ratio, all subjects reported that they had searched for the digits in the less complex class. At the 4:6 ratio, however, the subjects were not unanimous in their choice. As this would raise difficulties in interpreting the performance data it was decided, while still running the experiment, to continue testing subjects until six records were obtained from subjects who had attended to the less complex class. In all ten subjects were tested. Four of these reformulated the instruction at the outset and searched for the digits in the more complex class. Of the six who chose to search for the digits in the less complex class, two did so from the beginning, two considered changing but thought the more complex class was too large to 'visualize' and two tried to change but reverted to the less complex class after the first few trials.

All subjects given the C instruction reported that they had attended to the less complex class as specified in the instruction.

Performance

The times taken per sheet are shown in Table 2 and Fig. 1. The errors, shown in Table 3, are broken down into omissions, where subjects failed to tick a digit, and false positives, where they wrongly ticked a digit.

BvC. At both ratios the B instruction resulted in slower working than the C instruction and these differences were significant ($p < 0.05$)* on all trials, except the first at the 2:8 ratio. There were also differences in both the level and the pattern of errors. The B instruction led to more errors at the 2:8 ratio ($p < 0.03$) but not significantly more at the 4:6 ratio ($p < 0.07$). With the B instruction there tended to be more false positives than omissions. With the C instructions the errors were nearly all omissions. Under both B and C instructions the errors mainly occurred with respect to the digits in the class the subjects were searching for.

AvB. As might be expected from the subjects' reports about which digits they had searched for, the time taken per sheet under instructions A and B at the 2:8 ratio did not differ except on the first trial ($p < 0.05$, two tailed). At the 4:6 class complexity ratio where subjects did not reformulate the A instructions they took less time per sheet than those given the B instruction on all trials ($p < 0.05$).

With regard to errors, at the 2:8 ratio there was no difference in either the level or pattern of errors under instructions A and B. At the 4:6 ratio, however, while there was no signficant difference in the level of errors under A and B the pattern was different. With the A instruction omissions were much more frequent than false positives. This pattern of errors was characteristic of those given the C instruction and the opposite to the error pattern of these given the B instruction.

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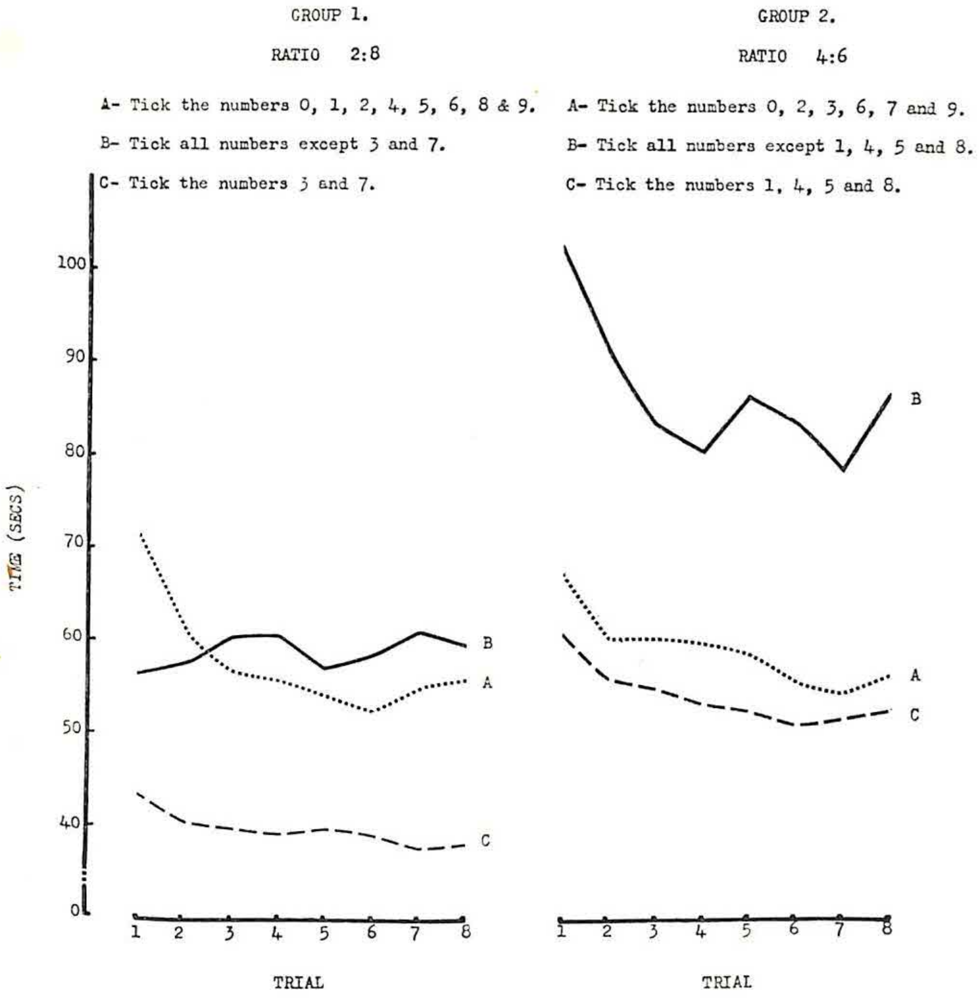
* Unless stated otherwise the two-tailed test of significance was used and the statistical test was the Mann-Witney U Test (Siegel, 1956).

AvC. This comparison is of less interest than the others since these instructions both included definition by inclusion, the A-form enumerating the more complex class and the C-form the less complex one. At the 4:6 ratio the A instruction led to significantly more errors ($p < 0.05$) but the pattern of errors was similar, with many more omissions than false positives. Those searching for six digits (A) tended to be slower than those searching for only four (C) but the differences on any one trial were not significant. At the 2:8 ratio subjects reformulated the A instruction into a B form and searched for the digits in the less complex class. This led to a difference in the pattern of errors between A and C. Those given the A instruction had more false positives than omissions whereas those with the C instruction had more omissions than false positives. As might be expected from the comparison of B and C the A instruction was associated with slower performance ($p < 0.05$) and more errors ($p < 0.01$) than the C instruction at the 2:8 ratio.

TABLE 3: THE TOTAL NUMBER OF ERRORS PER GROUP, DIVIDED INTO OMISSIONS AND FALSE POSITIVES, FOR TRIALS 1-4 AND 5-8, AND THE TOTALS FOR ALL TRIALS

Instruction Ratio 2:8	Trials 1-4	 5-8	Totals	All Errors
A Omissions False Positives	16 1	12 3	28 4	32
B Omissions False Positives	13 28	6 39	19 67	86
C Omissions False Positives	28 53	10 49	38 102	140
Ratio 4:6				
A Omissions False Positives	30 1	21 5	51 6	57
B Omissions False Positives	31 25	11 18	42 43	85
C Omissions False Positives	104 15	41 15	145 30	175

FIG. 1. THE MEAN TIME TAKEN PER TRIAL.



GROUP 1.

RATIO 2:8

A- Tick the numbers 0, 1, 2, 4, 5, 6, 8 & 9.

B- Tick all numbers except 3 and 7.

C- Tick the numbers 3 and 7.

GROUP 2.

RATIO 4:6

A- Tick the numbers 0, 2, 3, 6, 7 and 9.

B- Tick all numbers except 1, 4, 5 and 8.

C- Tick the numbers 1, 4, 5 and 8.

DISCUSSION

From the subjects' reports about which class of digits they searched for it is clear that at lower ratios (2:8) they preferred to attend to the less complex class despite the factor of definition by exclusion which entailed their searching for one class and responding to the other. At higher ratios (4:6) subjects preferred to attend to the more complex class, despite its greater complexity, presumably to avoid the difficulties associated with definition by exclusion.

Examination of performance under instructions B and C, in which the class of digits searched for was the same, showed clearly that definition by exclusion led to inferior performance both in terms of speed and accuracy of work. Under both instructions the errors occurred mainly with respect to the digits searched for but with the B instruction the errors were mainly false positives whereas with the C instruction they were nearly all omissions.

A comparison of performance under instructions A and B, in which the class of digits responded to was the same, showed that two instructions having the same formal meaning led to a similar level of performance at the lower ratio (2:8) and to significantly different levels of performance at the higher ratio (4:6).

The results showing that subjects transform their instructions at some class complexity ratios but not at others, indicates the presence of preferences expressible in terms of class complexity and method of class definition. The choices made in the present experiment were mostly good ones as judged by performance. Even at the 2:8 ratio those who transformed the instruction: "Tick the the numbers 0, 1, 2, 4, 5, 6, 8 and 9" and searched for the numbers 3 and 7 were probably faster as a result although there is no control data on this point. However, performance when ticking six numbers defined inclusively (4:6,A) was approximately the same as when ticking eight numbers defined exclusively. It might, therefore, take longer to tick eight numbers when they are defined inclusively than when they are defined by exclusion. Thus the only subjects who clearly worked with an inferior form of instruction, as judged by performance, were those at the 4:6 ratio who did not reformulate their instruction "Tick all numbers except 1, 4, 5 and 8"; it is, however, significant that ten subjects had to be tested before six were found who did not transform the instruction.

These results, however, cannot tell us what would have happened if subjects had not had to use the instruction. Had the task been merely to prepare instructions for different situations it is possible that subjects would have formulated instructions which were not optimal for performance.

Two possible approaches to the reasons for the difficulties associated with definition by exclusion in this task are as follows. Instructions like "Tick all numbers except 3 and 7" do not explicitly instruct the subject as to which digits he should respond. He is left to respond to stimuli which are not specified. Thus unless he enumerates these for himself he is constantly driven back to the instruction in its original unsatisfactory form. This suggests that instructions of this form give rise to greater uncertainty as to which stimuli the response has to be made. In contrast the stimuli to which the subject must not respond are clearly specified. In the control instruction "Tick the numbers 3 and 7" the stimuli to which the subject must respond are clearly enumerated while those stimuli to which he must not respond are not specified. Since the latter form of instruction facilitates performance the difficulty associated with the former may arise from the uncertainty associated with the stimuli to which the response *has* to be made.

Another approach lies in the remarks by Wallach (1959) that "presentation of an instance of an inclusion class requires one to make a particularly suitable response of some sort, while presentation of an example of an exclusion class requires one to refrain from making, or withhold, the response that would be appropriate for an instance of the excluded class." He also considers the possibility of an innate preference for the presence rather than the absence of stimulation which at the conceptual level might be associated with a preference for the presence of the positive defining properties of the class searched for. Stimulus response preferences of this kind are analogous to those usually discussed in terms of S-R compatibility, Fitts & Seeger (1953). With the instruction "Tick all numbers except 3 and 7" subjects must withhold the response to the class they are searching for and respond to the class they are not searching for. If, however, it is in some sense natural, or habitual, to respond to the object of a search once that object is located and not to respond to all other objects, then such instructions are associated with high S-R incompatibility. Thus, learning to respond to the class they are not searching for and not to respond to the class they are searching for, would be associated with interference deriving from established S-R tendencies to do the opposite. The importance of high S-R compatibility in facilitating performance in a number of tasks has been demonstrated by Fitts & Seeger (1953), Morin & Grant (1955), Welford (1958, Chapter 6), Leonard (1959), Broadbent & Gregory (1962), and Fitts & Switzer (1962).

The possible nature of the class — response tendencies in this task can be approached by considering the main characteristics of visual search and inspection tasks.

The searcher seeks something which is not present, either for it's own sake, or as a means to an end. Usually he is familiar with the physical properties of the item and can discriminate such items from other similar items not possessing the critical features. When a potentially wanted item is not in the immediate vicinity the searcher casts about until he encounters one. The item is then examined and this inspection involves checking whether or not the item possesses all the defining characteristics of the wanted class. If the item is a member of the wanted class it is retained or acquired, if it is not it is discarded or left. In the former case the search may be discontinued, in the latter it is usually resumed. In terms of manual responses a wanted item is usually approached, reached for and held, while an unwanted item is avoided, or, replaced. Thus items from the wanted class are retained while the rest are rejected.

In any particular culture a variety of responses have meanings expressive of retention and rejection, and are used as the wanted items take particular forms. In many search tasks wanted and unwanted items are just marked accordingly when found. Only one identifying mark is necessary to distinguish two classes and it is common in inspection tasks to respond to only one of the classes. In this experiment, one group ticked the wanted items, another group ticked the unwanted items. In English the tick (√) response is used to draw attention to something, for example, to mark a name on a list as having been checked, and it has a connotation of approval, correctness and desirability. (This fact was only realised, however, after the experiment was completed. Originally this response was chosen simply as a suitable response for this kind of task. Encircling, underlining, deleting, crossing out and other possible responses were rejected at the time as less suitable). Thus in this experiment subjects were asked sometimes to make a response to the unwanted class which would appear to be more appropriate to the wanted class and vice versa. This occurred, for example, with the instruction "Tick all numbers except 3 and 7." The question then arises whether, or not, some response other than tick would facilitate performance under this form of instruction. A similar manual response but one with a different connotation is "delete" (/). In English to delete means to strike out, or erase, and it has a connotation of disapproval, wrongness and undesirability. This suggests that the instruction "Delete all numbers except 3 and 7" might improve performance since subjects would now be making a 'rejecting' response to the unwanted class.

TABLE 4: THE MEAN TIME TAKEN PER TRIAL IN SECONDS
THE STANDARD DEVIATION (S.D.) IS SHOWN IN BRACKETS

	Instruction	Trial 1	2	3	4	5	6	7	8
D	Time	77.4	68.3	71.8	72.9	65.8	64.4	70.1	69.1
	S.D.	(12.7)	(8.4)	(13.3)	(12.8)	(8.0)	(8.1)	(10.3)	(11.3)
E	Time	96.1	83.5	79.9	74.9	68.7	66.7	68.9	69.8
	S.D.	(21.5)	(11.4)	(10.3)	(7.3)	(9.3)	(7.9)	(7.8)	(8.8)

However, they would still be avoiding items from the class they were searching for. This illustrates the difficulty arising from the use of definition by exclusion which entails that the items enumerated, and searched for, must be avoided, whereas it is usual to attend to, seek and respond to items from the wanted class. (Whether, or not, a reformulation of the instruction, e.g., into "Leave the numbers 3 and 7 and delete the rest" would alter the difficulty is now being investigated).

From this admittedly sketchy analysis an optimal class-response relationship can be proposed as follows. Performance should be facilitated when 'accepting' items from the class searched for and 'rejecting' those from the other class. Some data from another experiment provides support for this suggestion, while indicating that class-response incompatibility, produced by reversing this relationship, may be overcome fairly quickly when a response is made to both classes.

Experiment 2

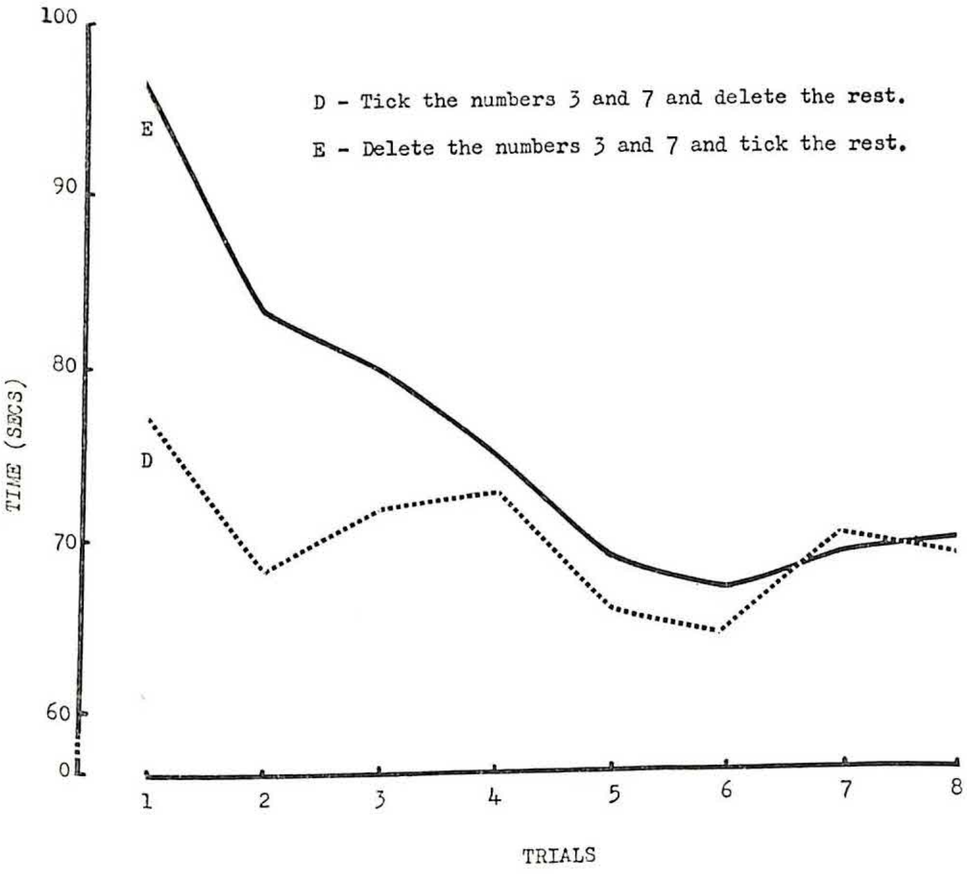
Two groups received the following instructions:

Group D: 'Tick the numbers 3 and 7 and delete the rest'.

Group E: 'Delete the numbers 3 and 7 and tick the rest'.

Thus the instructions required the subject to respond to both classes but the wanted-unwanted connotations of the responses differed and the class-response relations in instruction (D) were reversed in instruction (E).

FIG. 2. THE MEAN TIME TAKEN PER TRIAL.



Method and results

The same material was used as for subjects at the 2:8 ratio and the procedure was the same as in the first experiment. The subjects were eighteen students of psychology of both sexes and were assigned to the groups at random.

The mean response times per sheet and the number of errors, broken down into 'tick' and 'delete' errors, for each group are shown in Tables 4 and 5 and

Fig. 2. In Table 5, 'delete' errors are those where a digit was deleted when it should have been ticked, and vice versa in the case of 'tick' errors. To begin with Group E were slower than Group D. On the first trial the difference was only significant ($p < 0.05$) on a one tailed test, but on the second trial the difference was significant ($p < 0.02$) on a two tailed test. Thereafter, as Group E improved with practice, their time became similar to that for Group D. Group E also made significantly more errors during the first four trials ($p < 0.05$, two tailed test) but as their speed of work increased so their error rate decreased and became similar to that of Group D. In contrast to the improvement with practice shown by Group E, Group D showed little change either in speed, or errors, over the eight trials.

TABLE 5: THE TOTAL NUMBER OF ERRORS PER GROUP, DIVIDED INTO 'DELETE' AND 'TICK' ERRORS, FOR TRIALS 1-4 AND 5-8, TOGETHER WITH THE TOTALS

Instruction		Trials 1-4	Trials 5-8	Totals	All Errors
D	Delete	43	48	91	145
	Tick	28	26	54	
E	Delete	95	32	127	226
	Tick	79	20	99	

CONCLUSION

The first experiment showed that the economy gained by defining the more complex class in terms of the less complex, while obviously useful in conveying and storing information, had an adverse effect on performance when used in an instruction for one kind of classification task, except when the ratio of the class complexities departed markedly from unity.

The difficulties associated with definition by exclusion in the instruction appear to arise from greater uncertainty about which items to respond to, since these are defined indirectly, and from higher S-R incompatibility, since the subject must respond to items he is not searching for and not respond to those he is searching for. Some indirect support for the reality of the latter source of difficulty was cited from a second experiment which showed that subjects could make an accepting response to the class they were searching for, and a rejecting response to the class they were not searching for, more rapidly than the converse, at least to begin with.

ACKNOWLEDGEMENTS

Dr Sheila Jones assisted in the administration of the first experiment. The data quoted in the second experiment was obtained in the pursuit of another question in collaboration with Dr Jones, who has since investigated other class complexity ratios.

The author also wishes to thank Mr L. Buck and Mr D. Legge for helpful comments throughout.

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A Leap Forward in the Social Sciences?

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THE Heyworth Report[1] has been eagerly awaited by psychologists who have been involved in any way, both with the academic development of the social sciences and their application since the 1946 recommendations of the exceptionally distinguished scholars under Sir John Clapham.[2] They will not have failed to develop opinions, necessarily more or less grounded in their limited experience, of the progress that has been achieved on the financial basis of the Clapham earmarked grants. But the overall picture has been uncertain in the absence of adequate investigation. Of course, in a more rational society, social science departments, if not universities, would have required in 1946 something more in the nature of an academic 'job analysis' than the perfunctory introduction to the Clapham Report provided. Furthermore, they themselves might indeed have suggested that some continuous oversight, advice and historical documentation of all aspects of the subsequent development might be provided. Though in retrospect it seems regrettable, it could scarcely have been expected at the time that the wise men under Clapham's guidance could have avoided, without compromising any sacred academic independence, the situations detailed in Appendix 2 of the Heyworth Report. This reveals that a number of universities had unexpended balances in 1952 and a few still had money left over in 1962; that a university could report of its five-figure grant that the use made of this Clapham money could not be distinguished; that another university could discontinue teaching posts and retain a balance of some thousands in hand as late as 1964, while others, to one's knowledge, were working with sweated academic labour. But even the Interdepartmental Committee, appointed on the Report's recommendation 'to survey and advise upon research in Government Departments' proved still-born. It last met in 1960. "Most of those giving evidence to us," comments the Heyworth Report, "had never heard of it."

Many must have hoped that the Report of the Committee under Lord Heyworth appointed by the then Right Hon. R. A. Butler would provide a blueprint rather more social-scientifically challenging than the earlier benevolently anarchic approach. "We can advise the Treasury to provide the money; nothing more is needed for the universities to get on with a job which is henceforth to be considered academically respectable and money-worthy", would seem to have been the attitude.

Unfortunately, although the much smaller Heyworth Committee has produced a much larger and more argued report, it shows itself to have been handicapped by the absence of adequate representation of some of the main social sciences themselves. The error of the Clapham Committee had been unaccountably repeated. No argument in respect of an 'imperial interest', of social scientists as cobblers who might 'think there is nothing like leather for city walls', can counteract the need for continuous specialist comment on evidence taken. The probability is, indeed, that the advice of a minority of informed social scientists would have tempered some of the more optimistic expectations of the report and led in certain instances to more informative exposition of the statistics gathered. The nettle of academic anarchy might also have been grasped without timidity and some measure of control devised which would reduce, if not avoid, the dissipation of scarce human and material resources in the present unavoidably explosive development of the social sciences.

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[1] *Report of the Committee on Social Studies.* Cmnd. 2660. London: H.M.S.O., 1965.

[2] *Report of the Committee on the Provision for Social and Economic Research.* Cmnd. 6868. London: H.M.S.O., 1946.

But the most captious critic would have to agree that the Report and its recommendations are worthy on the whole of a warm welcome. The immediate action of H.M. Government was entirely merited. A great amount of information has been assembled and is presented, almost invariably, in as clear a manner as the complexities of social studies and social sciences, widely interpreted, allow. Its bulk (100 pages) compared with its leaflet-sized predecessor is a token of a general acceptance of the need for full public information and discussion on matters of policy and an indication of the wide interest in the application of scientific principles of investigation in industrial and social problems.

Part I of the Report is a 'Review of Research' and consists of three chapters to which 26 pages are devoted: 'Introductory', 'History since 1945' and 'Expenditure on Research 1962-3'. Part II is as long and is divided into an Introductory Chapter on 'the need for research and the needs of the researcher', and chapters on 'Producing the Research Workers', 'Organisation of Research in University Colleges and Institutes', 'The Use of Research', 'A Social Science Research Council' and 'Other Issues'. The 'Principal Conclusions and Recommendations' are summarised succinctly in pp. 54, 55 and 56 and there follow five Appendices relating to evidence, schedules of the research questionnaires, earmarked grants (Clapham) 1942-52, Research Institutions outside universities, Estimates of Cost of Research 1962/3 and Tables of Occupations taken up by students in Social Sciences 1961-63.

A point which is likely immediately to raise many a psychologist's eyebrow, if not his hackles, on reading the introductory discussion on definitions and scope, concerns the omission of psychology from the 'main social sciences' as 'well understood in universities'. 'Social Psychology' appears as a 'discipline' in its own right and although it is seen that the social sciences are likely to become more interdependent, the importance of the link which psychology provides between the social and the biological sciences is ignored. This is an unaccountable defect of perspective, especially in view of the wide discusion of the Two (or is it Three?) Cultures by social scientists interested in the Unity of Knowledge. In the discussion of 'Developments in Some Disciplines', Chapter II, paras. 35-38, p. 11, the same curious and misleading approach is shown. Paragraph 36 reads: "Although Departments of Psychology have grown in size and number their main interest has been in the biological aspects of the subject. Social psychology has been particularly neglected in British Universities compared with its development in the United States. One contributory factor to this neglect has been the dispersion of social psychologists among departments of psychology, sociology and social administration". A criticism at some length of this paragraph, pregnant with question-begging assumptions, appears in my Presidential address to Section J of the British Association[1] and the following points only need here be made: *First*, that the hypertrophy of American *theoretical* social psychology is no good model to follow, nor is the simple surgery of an institutional separation of social psychology from the main body of psychology likely to give a healthier aspect to social psychological studies; *second*, only by some curious theoretical 'tunnel vision' can social psychology be seen as exclusive of educational psychology, industrial and occupational psychology, clinical and abnormal psychology and ergonomics — all of which are more likely to be soundly established within Departments of Psychology; *third*, human biology is making such strides that the links of psychology with the 'life sciences' must be strengthened, not weakened, if we are to make the continuous re-assessment of problems concerning human abilities and behaviour which the biological organism mediates. On this point the Committee would have been strengthened by the addition of a psychologist with experience of the applied fields of research and a social psychologist in the narrow sense. The experience and judgement of a Bartlett or a Mace would have been especially valuable and it is difficult to understand why it was ignored. It is in any case surprising that psychology was so under-represented on the biological and experimental side in the large first two invited seminars of January 13th and 14th 1964, when the field and boundaries of the social sciences were discussed and the present state of knowledge of the social sciences assessed.

The compilation of the summary tables of statistics in Part I has clearly provided some headaches of nomenclature and classification. The authors warn us with regard to Tables 9 and 10, concerning Teaching and Research Staff, Higher Degree Students and External Research Funds in 1962-3 and their areas of application, that the figures should be used with caution because of difficulties of classification and this warning could well be extended to all the other tables. It has not always been possible to avoid the simplification that conceals important differences. One would instance the use of the term 'Sociology Group' to cover both Sociology proper and Social Administration. The point made in paragraph 73, that the external funds of the 'Sociology Group' are large, relative to the number of staff teaching the subject, might have been further illuminated by comparing the number of research staff in Sociology and Social Administration with the number of Honours degree students in these fields and with External Research Funds which each deploys. The same also might have been done for psychology (though in Table 9 described as only a 'related discipline'). One of the anxieties which observers of the current scene must have is that the research posts available must not be allowed to outstrip the developments at first degree level. Otherwise the quality of those entering full-time research may well deteriorate to the disadvantage of the academic reputation of the discipline.

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[1] *Advancement of Science.* (In Press)

It is this last important point which leads one to express a radical doubt about the general drift of the Heyworth recommendations. The situation at basic training level seems to have been insufficiently analysed so that sound foundations of a rapid expansion of research personnel remain to some extent undemonstrated. To the writer there still seems much to be done in respect of undergraduate teaching before an expenditure by the Social Science Research Council of £2¼ million in four years time would be realistic and the provision of 400 research awards in 1965/6 (increasing in 1966/7) and 20 research fellowships, the foundation of more Graduate Schools, (Recommendations V to X, p. 54) would be taken up by candidates of sufficient maturity of judgement, intelligence, training, and breadth of education for research in the social sciences. More money for research there must be, but without temptation to go looking for research students in a scarce market among those who are only good enough to be closely directed data-collectors, tabulators and human computers, too narrow and unimaginative in outlook to be a creative member of a research team.

Could not the Report have placed more emphasis upon the improving (by earmarked U.G.C. grants à la Clapham) of the source of supply of research workers? The necessary expansion and improvement of first-degree teaching in the social sciences under proper library facilities and general educational conditions might have been emphasised as the first priority. In this way an even greater leap forward in the fields of applied research in two or three years time would be, in the event, less of a gamble. The men and women would be available, capable of taking full advantage of the opportunities.

Occupational Psychology, 1965, *39*, 209-214.

The Assessment of Undergraduates by their Teachers*

By D. J. WARREN PIPER

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THE aim of the study was to develop a method of collecting information about things which influence university teachers in their assessment of undergraduates. This paper will concentrate on the method and touch on the results only when they serve to suggest how the data can be handled. Assisting in the enquiry were 44 teachers, comprising the staffs of four departments of Colleges in the University of London. Between them they taught 381 undergraduates. Two of the Departments were in the Faculty of Arts, one in Science and the other in Engineering. Immediately it will be appreciated the population is too small and specialised to allow any general conclusions. But as has been pointed out the main purpose of the exercise was to develop a procedure for investigation. The procedure to be described was suggested by a method adopted by the Standard Oil Company of New Jersey (Abercrombie, 1951) to construct a report form for supervisors. Managers were asked to pick out particularly good foremen and not so good foremen and describe them. The terms the managers used were analysed to see what kinds of things were said about the good foremen that were not said about the poor ones and vice versa. Then selected statements were made up into check lists, which were used as part of a personal report form which was regularly submitted on every foreman.

The present investigation fell into three main stages. First a questionnaire presented each staff member with all the names of the undergraduates in his Department and asked him or her to mark five people in each year whom he was particularly pleased to have in the Department and five people in each year he was least happy about.

The second stage was to gather pen pictures of two students in each year in each Department. One being the student who had most often been included amongst those the teachers were particularly pleased to have, the other being the student most often included in the 'least happy about' category. Teachers were not required to complete a pen picture for a student they had not included amongst their own choices. In the pen picture respondents were asked to describe the person's assets and weaknesses and as far as possible to do so in operational terms. He was then asked to describe two incidents involving the student which had caused him to think "That's just like him". It was also requested that as far as possible one incident should show the student in a favourable light and the other in a less favourable.

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* The study reported here was carried out by the author under the auspices of the Research Unit for Student Problems as part of his work in the Advanced Course in Occupational Psychology at Birkbeck College. This paper was read at the XV International Congress of Applied Psychology held in Ljubljana, Yugoslavia, in August, 1964. A detailed account of the enquiry is given by Piper, 1964.

The third stage was the analysis. The descriptions of the student's assets and weaknesses were analysed first. The incidents were treated separately. The descriptions were broken down into statements, each being a discrete unit of information. Some of the statements described actual behaviour: examples of this kind are "He manoeuvres tutorial discussions to keep them going", "Attendance at lectures not very good", "Speaks French with an entirely English accent", "Occasionally wears American sweaters", "Seen at a soiree doing a quite uninhibited twist", and the rather sinister "Smiles often". Other statements were value judgments, such as "Intelligent", "Typical extrovert", "Emotionally immature", "Industrious", and "Her heart would be in Mayfair rather than in Bloomsbury". Each statement was typed on to a small card which also carried a code number identifying the respondent and the student in question. The pack of 870 cards was handed to a panel of three university teachers who were requested to classify them according to the kind of behaviour reported using a system of their own devising. In this study the judges produced the following categories, which could be arranged into three areas: Work, Social Behaviour and Personality.

WORK

1. Attitude to Work
2. Standard of Work
3. Basic Ability

SOCIAL BEHAVIOUR

4. Performance in Seminars
5. Relations with Academic Staff
6. General Relations with Fellow Students
7. Leadership
8. Independence
9. Outside Interests
10. Physical Appearance

PERSONALITY

11. Relations with Others
12. View of Self
13. Energy
14. Disposition
15. Reliability/Honesty
16. Feeling for Others
17. Stability
18. Maturity
19. Strength of Character
20. Courage

Each category had positive and negative aspects. For example, attitude to work had "Tried hard" as the positive pole and "Lazy" at the negative. Standard of work has "His final project eventually turned out to be the best in his year" at one end, and "Mid-sessional examination results very poor" at the other. Relations with academic staff ranged from "Ready to treat staff as human beings right from the first year" to "Pretended concern when I am telling him off." Leadership was indicated by "President of the Student Departmental Society" at the positive end and "Taken under everyone's wing" at the negative. Relations with others ranged from "She seems to have a positive attraction for an unusual variety of men students" to "Still awkward and shy." It is fair to say that the judges were not entirely satisfied with the categories they had constructed, but after eight hours of sorting the investigator called the session to a halt. The time such sorting takes is one of the problems the pilot study brought to light. It transpired that there was a close similarity between the scheme the judges devised and one which the investigator had devised on his own some weeks previously. If two or more statements made by one teacher about the same student were classified together, it was assumed that they were different ways of saying the same thing and for the purposes of analysis were therefore regarded as one statement.

The next stage, after the ordering of the statements into categories, was to find out which categories were built up with statements about favoured students and which categories mostly contained statements about the unfavoured students, because this might point to differences which the staff saw between the two kinds of student.

Another task was to find out which were the especially large categories because this might point to the topics which the staff appeared to take into consideration most when describing students. Of course it would not follow that these topics were the most important. To this end two indices were calculated for each category — a discrimination index and a preference index. The discrimination index indicated the extent to which the statements differentiated the favoured from the unfavoured student. The preference index indicated how popular a category of statements was amongst the respondents. A category could be said to discriminate well between the favoured students and the unfavoured students if there was a significant difference in the way that the two types of students were distributed in the positive and negative divisions. A two-by-two table was drawn up for each category, favoured and unfavoured students versus positive and negative statements. The relative frequency of statements is shown in Table 1. The probability value resulting from a chi squared test was taken as the discrimination index. The example is based on the data on "Standard of Work."

TABLE 1: THE STANDARD OF WORK OF FAVOURED AND UNFAVOURED STUDENTS

	Favoured Students	Unfavoured Students
Positive Statement	35	7
Negative Statement	9	22

Discrimination Index
=chi squared value
$=p<0.001$

The preference index also was expressed in terms of probability. This time the total number of judgments in a category was tested against the number expected if all the judgments had been distributed randomly against all the categories.

Some of the results will show how such data can be handled. Of course no general conclusions should be drawn from these findings as the numbers involved are very small. When these two indices were calculated for the categories four had a preference index beyond the 0.001 level, they were the three categories in the Work area, and the category labelled "Relations with Others". Of these four the three "Work" categories only carried a discrimination index beyond the 0.001 level.

By combining all the categories in each area other information can be brought to light. Table 2 shows the distribution of judgments in the three areas. It will be seen that the Work and Social Behaviour areas receive a high proportion of the statement but that Work and Personality areas provide the best discrimination between the favoured and less favoured students.

TABLE 2: DISTRIBUTION OF STATEMENTS IN THE THREE AREAS

	X	Y	X+Y	χ^2	p
Work +	124	26	150	52.06	$p<0.001$
Work —	26	64	90		
Social behaviour +	97	47	144	6.368	$0.02>p>0.01$
Social behaviour —	42	42	84		
Personality +	67	22	89	15.668	$p<0.001$
Personality —	27	35	62		
Total	383	236	619		

If the figures for the four university departments are considered in two groups, the Science and Engineering departments on one hand and the two Arts departments on the other, the picture given in Table 3 emerges. In the Science and Engineering departments the Work area contains most judgments, 91, followed by Social Behaviour with 68 and with Personality a long way behind with only 25. In the Arts departments Work and Social Behaviour share first place (that is, there is no significant difference between them) with 149 and 159 respectively, and Personality was again behind with 117. In all departments the Work statements successfully discriminated between the favoured and less favoured students. Only in the Arts departments was there any discrimination between the two groups of students shown by the Personality statements.

TABLE 3: TOTAL NUMBER OF STATEMENTS IN THE THREE AREAS, BY DEPARTMENTS CONSIDERED UNDER TWO HEADINGS

	Science and Engineering	Arts
Work	91	149
Social Behaviour	68	159
Personality	25	117

The figures given in Tables 4 and 5 show the proportion of statements made about the work of the twelve favoured students and the twelve less favoured.

TABLE 4: PROPORTION OF STATEMENTS ABOUT THE WORK OF FAVOURED STUDENTS

	Science and Engineering	Arts
Above average	6	0
Below average	0	6

TABLE 5 : PROPORTION OF STATEMENTS ABOUT THE WORK OF UNFAVOURED STUDENTS

	Science and Engineering	Arts
Above average	4	1
Below average	2	5

Where this is done it is found that all the favoured students in Science and Engineering departments have more than the average proportion of work statements, whereas all the favoured students in the Arts departments have less than the average proportion of work statements. With the less favoured students the division was not so clear as can be seen in Table 5.

It was mentioned earlier that incidents thought to be typical of the students' behaviour were also collected. The response to this section of the questionnaire was poor. 76% of the respondents provided at least one incident but only 50% of the incidents requested were forthcoming. It is clear that the procedure adopted was unsatisfactory. The incidents were divided into two kinds, those to do with academic work and those to do with other things. There was no difference between the kind of incident reported about favoured and less favoured students, but there was a difference between the departments. The Science and Engineering departments tended to write incidents concerning work whereas the Arts departments supplied incidents concerning other things.

Perhaps one of the impressive aspects of the study was the amount of co-operation the investigator received from the staff and students in the departments concerned. Nobody refused to complete the first questionnaire despite the fact that it required the respondents to name students whose desirability as a member of the department might be in doubt. However, only 31 out of the 44 teachers completed the whole task. 13 teachers, 11 of them from either the Engineering or the Science departments, chose students from only one or two years instead of all three. These two departments have large numbers of undergraduates and the reason most given by the staff for not completing the task was that they were insufficiently familiar with the students to know who they were most pleased to have and who they were a bit doubtful about. However, if a large enough sample could be taken the method should be able to suggest some real differences that might exist between the apparently successful student and, in the eyes of the teachers, his less fortunate brethren. It should be possible to construct a report form in a similar manner to that in the original industrial study. A check list could be made of statement usually associated with the kind of student staff prefer and those they do not. The student's score on such a list could possibly supplement the information given by examination results which it is sometimes suggested only tell half the story. It might also prove to be an interesting method of pointing the differences in values held from one Department to another.

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Vocational Intentions and Decisions of Aberdeen Arts Graduates

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THERE have been many reports on careers entered by graduates and on attitudes of undergraduates to various types of employment, particularly to teaching as a career. The special interest of this report is that, while it covers a small number of graduates in a restricted range of studies, it deals with vocational intentions over the whole period of their university courses and extends to cover their actual employment for eight or nine years after graduation. It was thus possible to examine at what stage their career decisions were finally made, and to compare job satisfaction and success of those who made an early decision with those who were undecided or who changed occupations. Those who recruit graduates or advise students may find it reassuring that, for this group at least, indecision about a career was not associated with any general inferiority of talent or academic performance, or with lesser satisfaction or success in their careers.

A total of 137 students who entered the Faculty of Arts at the University of Aberdeen direct from school in October 1953 were questioned about their vocational intentions six times during their undergraduate courses. This group was virtually a complete year-group: of the 174 entrants to the Faculty in 1953, 19 did not come straight from school, 15 others failed to graduate, and only three refused to co-operate in this inquiry. After graduation, information on the career actually entered was obtained on two occasions: first, six months after graduation, and again in 1965, some eight or nine years later. In the latter stage of the inquiry, two of the group died, but all except four of the remainder were traced. Thus, the report covers 131 graduates, 59 men and 72 women, a 95 per cent coverage of those eligible for inclusion.

For each graduate, a record was kept of entrance qualifications, university performance and score on a verbal reasoning test. Entrance qualifications were mostly Scottish Certificate of Education passes, which were translated into a scale measure, an Ordinary grade pass being assessed as half of a Higher grade pass. Assessment of university performance separated the 47 who took four-year Honours degrees, and the 84 who took the three-year Ordinary M.A. degree awarded by Scottish universities. The verbal reasoning test was the Moray House Adult Test, a timed group test, given to all the students during either the first or second year of study.

Six statements of vocational intention were obtained at intervals throughout the course of study. The first, third and fifth were in response to questions included in the matriculation record filled in on entry to university and at the beginning of the second and third years respectively. The second and fourth statements were obtained during individual interviews on the subject of careers, at the end of the first and second years respectively. The sixth statement was made in a questionnaire on vocational intentions, completed in the term immediately preceding graduation. The two checks on vocational decision, after six months and after eight or nine years, were done by postal questionnaire. Employment at the later time was assumed to be the final vocational decision, on the grounds that the majority of changes of employment occur in the first five years after graduation. However, in the case of married women who were no longer in paid employment, the last appointment held was taken as the final career decision. Post-graduate study was not classified as an occupation.

The validity of the verbal reasoning test is indicated by the mean scores of Honours and Ordinary graduates. The mean score of those who went on to take Honours degrees was 77.9 out of a possible 100, equivalent to an IQ of 128. The mean score of the Ordinary degrees was 71.7 out of 100, equivalent to IQ 122. The first class Honours students scored on average 81 (IQ 131), and in the Honours Mathematics group the lowest score was equivalent to an IQ of at least 135. There was of course a substantial overlap of score between Honours and Ordinary graduates, partly because of students of high ability who chose to do the shorter general Ordinary course in spite of good examination performance.

Answers to three questions were sought in the analysis of the data. (1) At what stage was a career decision finally made? (2) Is indecision about a career an indication of probable subsequent changes of occupation or lack of satisfaction or success in the occupation entered? (3) How do those choosing teaching compare with those who choose other careers?

Most students showed some indecision about future occupation during their university courses, though in the event only 13 per cent (17 students) changed occupations after graduation. 29 per cent (38 students) had decided on their career at the beginning of their university course. Most of these were students who entered teaching, though there were also some (for example, lawyers) for whom a relatively specific course of training tended to limit freedom of choice. At each stage a considerable number declared that they had made a final decision but subsequently declared uncertainty or a different intention. 33 per cent (43 students) reached a final decision during their university courses; and the remaining 38 per cent (50 students) decided at or after graduation. The last group included some of the most able students, who deferred a decision in the hope that a good honours award would enable them to go on to post-graduate study.

Table 1 shows the relation between uncertainty in vocational intention and instability of vocational decision. Five students are omitted from this table, three who entered university teaching from practical work in their own field and two who taught for short periods between appointments in law and divinity. Consistency of vocational intention was classified as follows: "mainly consistent" indicates no change in intention after the end of the first year of university study; "fairly uncertain" indicates that two or more different jobs were mentioned on the six occasions when they were asked about their intentions, or they were unable to state any specific job on one or two of these occasions; "very uncertain" indicates that no specific job was mentioned on three or more occasions. Table 1 shows that while indecision before graduation is associated with subsequent instability in employment, the large majority of those who were

TABLE 1: VOCATIONAL INTENTION AND VOCATIONAL DECISION

Decision	Intention Mainly consistent	 Fairly uncertain	 Very uncertain	 Total
No change	42	24	43	109
Changed job	4	2	11	17
Total	46	26	54	126

uncertain about careers did in fact settle in the careers they entered on graduation.

There was no significant difference in mean score in the verbal reasoning test or in entrance qualifications between the "mainly consistent" group (mean score 74.6; mean number of Higher passes 5.0) and the two "uncertain" groups (mean score 73.5; mean number of Higher passes 4.9). The ratio of men to women was similar in the two groups ("consistent", 42 per cent men: 58 per cent women; "uncertain", 46 per cent men: 54 per cent women). There was a difference in the ratio of Honours to Ordinary degrees ("consistent", 19 per cent Honours: 81 per cent Ordinary; "uncertain", 45 per cent Honours: 55 per cent Ordinary), to which reference has been made above.

Satisfaction and success in work were studied for the group of 58 who became teachers and were still teaching at the time of the final questionnaire, eight or nine years after graduation. (University teachers were excluded from this group.) These teachers were asked whether they had ever applied for, or considered applying for, a post outside teaching; and this was used as a measure of satisfaction in work. From a list of appointments held (as reported by each teacher) it was possible to identify those who had gained promotion, this being taken as a measure of success. Table 2 provides a comparison on these two points

TABLE 2: SATISFACTION IN JOB AND PROMOTION IN RELATION TO EARLIER CONSISTENCY OF VOCATIONAL INTENTION (TEACHERS ONLY)

Outcome	Intention Consistent	 Uncertain	 Totals
Satisfied	19	11	30
Not satisfied	16	12	28
Promoted	11	5	16
Not promoted	24	18	42
Totals	35	23	58

between the students who had chosen the career of teaching early and consistently in their university courses and those who had decided at a late stage to become teachers: on neither point was there any significant difference.

There was no evidence of any difference in talent between these two groups of teachers, in spite of the commonly held prejudice against the student who decides late (and therefore, perhaps, reluctantly?) to enter teaching. The students who had an early call to the vocation of teaching and those who came to it with hesitation had much the same mean test score (74.2 and 72.3 respectively), and the same mean number of entrance examination Higher passes (5.1 and 5.1 respectively). 72 students in this group completed courses of professional training as teachers in Aberdeen. At that time (1956-8) an assessment of teaching competence was made by the students' supervisor and was expressed as a percentage mark. The mean teaching mark of the "consistent" group was 66.2, compared with 66.7 for the "uncertain" group (no significant difference).

Comparing those who entered teaching with those who entered other occupations, there was no evidence to suggest that the best of the talent avoids the teaching profession (except that, as might be expected, the small group who undertook post-graduate study showed superior performance in all measures).

Some indications of how decisions on occupation were made by graduates were given by answers in the two interview sessions. These suggested that (a) many of these students lacked insight into their motives for choosing a career; (b) many were uninformed about careers; and (c) there was a tendency to regard choice of career as an emotional rather than a logical decision.

Obviously, there were some cases where the explanation of a career decision was straightforward and clear: these students showed knowledge of the job and conditions of work from personal experience, or declared a sense of vocation which was already influencing both their studies and their leisure activities. At most, some dozen of the 131 showed clear insight into their choice. The remainder offered inadequate reasons or were unable to give any reasons at all for a vocational choice. "It's difficult to say" or "I don't know" or mild protests at being asked to explain a decision, were frequent. Examples of inadequate reasons were answers of the type: "I decided long ago" or "I've always wanted to be a teacher, ever since I was a little girl." (Nearly one-third of those who said they had decided to teach gave this as a reason.) Some were content to seize on a single aspect of the decision and consider the decision thus explained: intending teachers said "I like children" or "I liked school"; a librarian said "I like books and would like to do research"; and one who planned to become a psychologist said she chose this because she liked reading and travel. All this is no doubt partly due to convention which inhibits frank discussion of personal motives with a stranger. But there was also a tendency to regard choice of career (like choice of spouse) as ultimately a matter for emotion, not of careful forethought and logical consideration. (Perhaps better decisions are made in this way.)

The suggestion that financial or social considerations should perhaps enter into choice of a career tended to be regarded with the same distaste as would be given to a similar suggestion in the field of matrimony. "I decided long ago" is said in the spirit of "first love, true love". Direct suggestion by parents seems to be limited by the same considerations in both spheres.

The interview on which the above observations are based occurred in the first two years of university study. Clearly, different attitudes emerge as a final vocational decision comes nearer, and the results quoted earlier suggest that we need not be unduly concerned about uncertainty in the early stages of a university career, provided that adequate information is available when decisions have to be made.

The above results are derived from relatively small numbers and refer to Arts students at the University of Aberdeen. It seems probable that different results would emerge from a similar study of Science students or students in another university. In this group, approximately one-third made final decisions on a career before entry to university, one-third during the course, and one-third after graduation. Of the few who later changed their occupational decision, two-thirds had previously been very uncertain in their vocational intentions, but the large majority of those who had been uncertain settled to the career they entered. A few very able students, seeking to continue to advanced study and research, deferred a decision until they knew their degree results. Apart from this, there was nothing to suggest that those who made an early decision were in any way superior or inferior to those who had been uncertain. Whether a decision is made early or late depends on the job as well as the person. Teaching and law are examples where familiarity and specific forms of training encourage early decision; research and management are opposite examples.

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Book Reviews

Industrial Organisation Theory and Practice. By JOAN WOODWARD. London: Oxford University Press, 1965. Pp. xi+281. Price 35s.

It is unfortunate that we should find interest in management growing at a time when the theoretical framework of the subject is still largely built upon the foundations of an ideology with limited empirical justification. Not surprisingly too much is being written on the subject which is at best verbiage and at worst misleading. In the circumstances it is easy for the practitioner and the academic to miss those few texts worth reading. Miss Woodward's book is one that should not be missed.

We are already familiar with Miss Woodward's earlier report (Woodward, J. (1958) *Management and Technology*. Department of Scientific and Industrial Research. Problems of Progress in Industry, Series No. 3. London: H.M.S.O.) in which she outlines preliminary findings on the link between organisation and technology. This book enlarges on the same theme and examines the relationship in greater detail. The book is divided into three parts. Part I describes the survey of 100 out of 110 firms in South Essex with more than 100 employees. Part II outlines less detailed case studies carried out in 20 firms with over 250 employees and three intensive studies of firms with mixed or changing technologies. Part III deals with follow-up investigations and a consideration of the problems and effects of change.

The author derives her technology variable from the production system and, for the purposes of analysing the results, eleven categories of production method are reduced to three, unit and small batch production, large batch and mass production, and process production. The chief results of the survey show how the variability among firms with respect to such organisational features as number of levels of management, percentage of the firms total turnover allocated to wages, and the numbers of employees controlled by the first line supervisor is linked with technology and is not only a function of leadership behaviour. The chapter in which technology and organisation are related to the success of the firm is less convincing. By 'topping and tailing' on success, derived from a variety of criteria, we end up with only 31 firms in the analysis. The results suggest that the successful firms in each production category may stand out from the others in that they tend to cluster round the median of their category on figures relating to organisational characteristics.

After explaining the methods used in the case studies, Miss Woodward goes on to outline a reclassification of organisation based on careful definitions of terms such as line, staff and function. In the case of the last she draws distinctions between 'task' and 'element' functions. Task functions, such as marketing, have specific and defineable end results which element functions, like personnel, do not.

The case studies provide a wealth of interesting data. For example, in one chapter the main aspects of the manufacturing cycle (development, production, marketing) are isolated and it is argued that the importance of each aspect *vis à vis* the other two varies from one technology to another. In a later chapter we find that change causes the greatest stress in the middle range of technologies particularly where the production system is moving into batch production. As one reads through the book two important trends become discernible. Firstly, and Miss Woodward points this out herself, there is a growing realisation that the relationship between organisation and technology is more complex than was originally thought. It is this complexity which calls for greater sophistication in the instruments of measurement, one of the few weaknesses in Miss Woodward's armour. Secondly, and this is inevitable in the shift from survey to case study material, increasing attention is paid to the part played by individuals.

This book is excellently presented. The tables are easy to follow and the text easy to read. Perhaps more important it illustrates well the methods by which the better applied social scientists works. A relationship is shown between two variables in a preliminary enquiry. Additional investigations are carried out to demonstrate that the link is 'causal rather than casual'. These studies show that the measuring devices in use are too crude to enable a more complete understanding of how the variables interact.

Finally an outline is given of attempts being made to measure the critical parameters of one of the variables. This is an admirable piece of work in both content and method.

DENIS PYM

The Selection Process. By MILTON M. MANDELL. New York: American Management Association, 1964. Pp. 512. Price $15.00.

This book provides a comprehensive survey of large-scale recruitment methods used in the U.S.A. Its author writes with authority and impartiality founded on 17 years' experience as Chief of Management Selection Methods for the U.S. Civil Service Commission. Emphasis is placed on the primary importance to any business organisation of suitable publicity and appeal, on selling the job as an attractive one and on making it attractive in fact. The organisation must succeed first in attracting a sufficient field of suitable candidates to apply, then in persuading the better candidates to accept the posts offered, and finally in retaining their interest and satisfaction with their work. Unless these conditions are fulfilled, refinements of selection technique are of no avail. The descriptions of the recruitment methods of various American organisations are enormously well-documented, with scores of specimen application forms, employment record sheets, interview evaluation forms, reference checking sheets and the like. The book thus puts any personnel director wishing to overhaul the recruitment methods of his own organisation in the position of being able rapidly to review the methods of his principal competitors and to profit by their experience.

The importance of job analysis is stressed throughout the book. Prominent, for example, among the common reasons suggested for incorrect evaluation of people seeking jobs is "failing to relate evaluation to job requirements, for example, preferring educated, clean-cut people for factory assembly jobs, even though these characteristics are related negatively to job productivity and low turnover". Later chapters describe the requirements of eight broad occupational groups, namely executives, engineers and scientists, computer operators and programmers, salesmen, office employees, blue-collar employees, supervisors, and overseas personnel. This last chapter contains much wise advice on the pitfalls confronting Americans serving overseas, and on the difficulty of obtaining reliable follow-up criteria. The psychologists of one company, for example, attempted a large-scale research project but abandoned it when they discovered that low ratings on the criteria provided by their overseas executives correlated with the desire to learn local customs!

This book uses a minimum of technical terms and contains very little statistical evidence, but it abounds in practical commonsense. It stresses, for example, the need when judging a selection method, first to determine its validity and then to consider its utility. Its validity should be assessed in terms of the increase in correlation obtained with some external criterion. Its utility depends upon numerous other factors such as the cost of the method in relation to its validity and the proposed use of the method, whether to eliminate those who do not achieve a certain score, to rank the test group, or only to give an additional source of information about them. (The highest degree of validity is needed for ranking purposes). As further examples of practical commonsense are the brief statements on page 404 of "A Teenager's Needs", including "To feel that she belongs and is like the group" and "To have fun", and on page 405 "Keep a Roster of Former Employees". This goes on to say "Don't overlook your reserve of *experienced* help. Former employees may now be anxious to earn extra money to pay for their new homes or to put their youngsters through college."

The three chapters on interviewing cover both the limitations of the interview and what can be achieved by it, especially in conjunction with written tests. The need for humility is mentioned, all interviewers being fallible, as is the desirability that interviewers for a particular purpose should not be too dissimilar in age, intelligence, etc. from the people being interviewed. Great stress is rightly placed on the need for training by means of practice interviews subject to candid comments from colleagues and instructors. Details are given of the interviewer training programme used by the Psychological Corporation. Some useful examples are also quoted, adapted from the

Sandia manual, of undesirable and desirable wording for the same questions. They illustrate the point, for example, that a skilful interviewer doesn't ask questions which can be answered "Yes" or "No". Most of his questions are worded so that the candidate has to elaborate his answers. He also repeatedly asks such questions as "How did you get interested in that?" and, "How did you feel about that?" The use of clinical psychologists and psychiatrists as interviewers is discussed on pages 201-203, the chief conclusions being that they vary in interviewing skill as much as non-psychologists but "when psychologists are qualified and experienced professional interviewers, their average ability is probably higher than that of non-psychologists."

Compared with the rest of the book, the two chapters on written tests and personality inventories are comparatively thin. The warnings about the ill-considered use of inappropriate tests are sound and fully justified by the examples given. On page 498 for instance an amusing anecdote is quoted from an article by Ross Stagner in *Personnel Psychology*, vol. 11, 1958: "A college professor demonstrated the quackery possible with personality inventories by giving each member of a personnel group what he reputed to be an interpretation of the member's personality and then asking him for an evaluation of the interpretation. Most thought the interpretation described themselves accurately, not knowing that each had been given an identical statement." On the positive side, however, more examples might have been given of tests well designed and efficiently validated, including some devised on this side of the Atlantic, especially tests of inventive-response type that are particularly suitable for use with high grade subjects in not unmanageably large numbers. Throughout the book references to work outside the U.S.A. are conspicuous by their absence; the only British writer quoted is Charles Dickens!

Occupational psychologists would be unlikely to find that this book would change their views in fields in which they are already expert. But it would be invaluable for reference purposes in other, related fields. It might, in some cases, also serve to open their eyes to the sort of advice that business men are likely to require of psychologists and to the way in which such advice should be presented in order to carry conviction.

E. ANSTEY

Proceedings of the Fifth and Sixth Human Relations Conferences, 1963 *and* 1964, *of the South India Textile Research Association.* Coimbatore: S.I.T.R.A., 1963 & 1964. Pp. 129. Price $4.

Compared with similar British Industrial Research Institutes, the South India Textile Research Institute is unusual. Besides its purely technological work it has a vigorous and highly qualified staff trained of social and behavioural scientists engaged in examining appropriate problems of the industry. For the past six years they have held an annual conference on "Human Relations." These two reports contain the full text of all papers presented as well as the discussions that followed.

From year to year the association may set up working parties recruited from within or outside the textile industry to examine special current problems. From year to year the working parties may report their findings. The reviewer was present at the sixth Conference and was very impressed by the quality of the papers, the close attention to scientific procedures and the care with which many of the studies had been conducted, as well as with the sophistication of the studies and the width of interests that had been explored. He was further impressed by the very extensive range of the organisations represented at the conference. It was by no means only a conference of the major cotton textile firms of South India, though these were very well represented. Among the non-textile institutions and organisations represented were the Service Administrative Colleges; All India Radio; Cement; Engineering and Petroleum Industries; Institutes of Technology; Productivity Councils; Government or State Government Departments; and State Electricity undertakings. One reason for this wide coverage is the growing belief that industrial, commercial and military efficiency are not by any means dependent only upon technological advances: a social revolution is accompanying the industrial revolution of modern India, and this also must be studied and understood.

The 1963 Conference had three main themes: problems in employee relations, leadership in industry, and productivity and social environment. A study group report on supervisory function and authority pattern showed very wide variations between the three different industries studied, each of them differing substantially from the typical pattern in the United Kingdom. In a study of grievance procedure the method of enquiry followed well worn and appropriate lines and the findings show an absence of any systematic approach in any of the mills studied. Half a day was devoted to discussion on problems of leadership in industry. It is interesting to note that one paper presented by a member of the S.I.T.R.A. staff described a strictly laboratory experiment set up to investigate conditions in which leadership behaviour could most easily emerge. It seemed from the discussion that this paper was found to be too difficult except for the specialists. The reviewer can understand this for the paper was of a quality appropriate to a scientific meeting of professional psychologists.

At the Sixth Conference in 1964, your reviewer was not suprised that a substantial portion of the time was given to papers dealing with problems of social change. India is very aware that the gradual industrialisation of both urban and to a less extent rural areas is producing a series of problems that cannot be ignored. It is noteworthy that the introductory paper on this subject came from the Professor of Psychology in Annamabi University in South India. A psychologist employed by S.I.T.R.A. reported some experimental studies of the problems of adjustment to urban conditions of workers who had recently immigrated from rural areas. Use was made of projective and other tests, largely based on American work of McCalland, Kluckholm and others. The findings were not very clear cut, but it is significant that work of this sort can be undertaken by a textile research institute and reported in this way. Since Independence, India has adopted the metric system of measurement and one paper dealt with the problems of adaptation to the changes so imposed. Interviews were conducted before and after the metric system came into operation. A good deal of preparatory work had been done both nationally and within the industry. The majority of persons interviewed felt that the change-over was smooth and successful. The fact might be of significance in our own country.

A second theme in this conference dealt with motivation and morale, and several research reports were presented on job satisfaction and other aspects of motivation. Interesting and useful work is being undertaken in this area and it deserves more publicity than it receives, either in India or elsewhere. The third theme concerned industrial welfare, and a number of accounts were given of recent developments in this area. It is perhaps not widely known that it has for a long time been quite normal for industry, in the private and public sectors to provide subsidised housing for workers and staff. With the present relatively rapid pace of industrialisation, housing has become an urgent social problem. The report of a study group on the current position in the local area not only reported the actual position but also made pertinent recommendations.

These conferences clearly serve a very useful purpose, firstly within the textile industry itself, and secondly between psychologists and other behavioural scientists who are employed in different organisations, and often are uninformed about the work of their colleagues elsewhere.

H. G. MAULE

Signal Detection and Recognition by Human Observers: Contemporary Readings. Edited by JOHN A. SWETS. New York: Wiley 1964. Pp. xi+702.

Until recently choice between psychophysical methods has been largely a matter of practical convenience. The different methods have been shown on many occasions to yield rather different results, because, as Woodworth wrote (*Experimental Psychology*, 1938), they presented the subject with slightly different tasks. Blackwell (*Psychophysical Thresholds*, 1953) suggested that three factors, reliability, 'inferred validity' (the extent to which 'variables considered irrelevant to sensory functions will influence threshold data') and smallness of threshold values could all be used to define an optimum method; and his arguments were, and possibly remain, the most satisfying bases for choice of psycho-physical methods for exact experimentation. However, during the last decade, we have seen the development of new statistical procedures for deriving parameters from psycho-physical data which are thought to be independent of the method of collection. If the claims made for the new procedures can be sustained then a major advance will have been accomplished; and one could share the enthusiasm of the chief proponents of the new system and say that psycho-physics has been lifted out of the Dark Ages.

The book under review reprints 33 of the more important papers dealing with new procedures; and the general bibliography lists a total of 138 relevant papers (96 published, the rest privately circulated) all dated between 1954 and 1963. The editor, Swets, together with Tanner, Green, and Birdsall contribute 19 of the 33 reprints.

This new and powerful movement in psycho-physics has its roots in statistical decision theory and its engineering applications, where the problem is to optimise the process of detecting signals in noise. Here one can usually specify the statistical parameters of a noise and, therefore, estimate the probability that the noise will exceed given levels, and also the probability that a signal of given magnitude plus the noise will exceed the same levels. Furthermore cut-off levels can be computed which will optimise signal detection for a stated cost in the proportion of false positives and missed signals. When psychophysical data includes false positives precisely the same statistical procedures can be used. However the interesting features of this approach to psycho-physics are not the statistical details but the assumptions that must be made about underlying psychological and physiological mechanisms.

In the first place one cannot get along this route at all without a noise generator of some kind. In most of the new experiments physical noise is deliberately added to the displays presented to subjects; but writers concede that physiological noise may play a part, possibly a dominant role in some circumstances (e.g. in absolute threshold measurements). Peaks in the noise, however generated, are the stimuli for the false positives. This is to be contrasted with all previous work on guessing and guessing corrections in psycho-physics: guessing has no place in the new system.

Secondly there is a group of assumptions about the "optimum operator." In a purely physical system a cut-off level can be chosen to yield a given proportion of missed signals and false positives. In a psycho-physical system an experimenter cannot set cut-off levels. On the other hand, if the operator is assumed to be an optimising mechanism in the same sense as the machines discussed in statistical decision theory, then it is possible to calculate what his cut-off levels are. It is this possibility which, in principle, enables experimenters to choose any psycho-physical method and arrive at an absolute measure of performance. Some limited experiments show that, in fact, this seems to be achieved.

This by no means exhausts the list of assumptions made in the decision theory approach, nor the flow of intriguing hypotheses about the human operator. Perhaps it is a little unfair at this stage to complain that indeed there has been little systematic attempt to check on the validity of any underlying assumptions. A great deal of work has been accomplished in a very short time. What has been done is really only just beginning to fire the imagination of psycho-physicists outside the small group who introduced the new procedures. The next decade should see an exciting consolidation and development of the work described in this book.

The specialist in psycho-physics without doubt will consider the book a very desirable luxury. The non-specialist, who wants to get an overview of an important movement, will find these reprints the most convenient source of information at the present moment. However the difficulty with all such collections is that each paper duplicates explanations in the others (a good writer could reduce the 700 pages printed to less than 100); and what is really needed is a dispassionate review of the statistical procedures, the underlying assumptions, and the results obtained so far.

In his editorial Swets acknowledges the need for such a systematic text, and seems to be promising to produce one. This indeed would be valuable. E. ELLIOTT

Aviation Psychology. Edited by A. CASSIE, S. D. FOKKEMA and J. B. PARRY. The Hague: Mouton, 1964. Pp. 125.

'As higher levels of flying are reached, it becomes increasingly necessary to know the conditions in which aviators can operate and to be able to record the changes that occur in flight.' 'Future developments in high performance aircraft will accentuate problems of man's reaction as the monitoring and control effecting link in the aircraft system complex.' These quotations from the editorial introduction and from one of the chapters of this book are variants of the traditional greeting of the British aviation psychologist. In this book, which is a collection of twelve conference papers, the different interests and points of view of aviation psychologists of different European nationalities can be seen side by side. For example, in Germany the main interest appears to be on the individual pilot, whereas in Great Britain the interest appears to extend more to pilots in general.

It is disappointing to observe that there is a minority of attention given in these papers to the experimental approach, especially in view of the editorial assertion that the resemblance of the cockpit to a psychological laboratory 'is largely responsible for its appeal to psychologists.' One of the few papers that set out to describe experimental research on pilot behaviour is by Russell Davis, who draws attention to the importance of the effects of anxiety on piloting skills. His work on the Cambridge cockpit received initially a great deal of public attention as a result of the publication of *Pilot Error*, but in spite of this, it is true to say that the emphasis in laboratory studies of pilot skill in recent years has been almost entirely on the physical aspects of the pilot's task rather than on his emotional attitudes, and it is a good thing that we have been reminded at this time.

The most striking of all is the paper by Steininger. This gives a very detailed psychological analysis of the problems of training student pilots and, apart from a few contradictions, gives an extremely vivid and convincing account of causative factors in student pilots' behaviour. This paper is the only one that really gets down, or rather up, to a close study of the pilot at work, and it shows that the author knows a great deal about both the aviator and his aeroplane. It is natural and logical that psychological works published as being specific to one particular industry such as aviation should smack of the atmosphere of that industry. In comparison to Steininger, several of the other authors create a remote and academic impression.

Other contributions deal with studies of accident liability, proficiency criteria and personnel selection, mostly from a methodological point of view. These will certainly be of interest to workers in these fields in other industries.

As a whole, the book cannot be regarded by any means as a text-book or as a complete survey of the field of aviation psychology, either of which a prospective reader night take to be implied by the title. For this reason it is fair to say that the title is a rather sweeping one. Very little of the work reported appears to apply to the field of civil aviation. For example, Russell Davis's points about anxiety are very much more pertinent in the sphere of military aviation than in civil aviation, where, over the years, the factor of anxiety has been progressively diminished until it has now become of only marginal significance. Other important areas that are not represented are the study of pilot's workload, and experimental ergonomic research.

K. F. JACKSON

Inside the Black Room. By JACK VERNON. London: Souvenir Press, 1963. Pp. xvii+203. Price 21s.

Undoubtedly there is an opening for a popularly written account of the strange experiences of those exposed to what has been called 'sensory deprivation'; when, for instance, an individual remains alone inside a 'black room' in almost total darkness and silence for continuous periods of up to four days. Dr Jack Vernon has described the investigations performed by himself and his collaborators of the events which occurred. It should be noted that the conditions were somewhat different from those of the first experiments on 'sensory deprivation', carried out by Professor Hebb at McGill University, in which individuals were exposed to continuous unvarying light and sound over similar periods. Most of those tested by Vernon exhibited after a time increases in suggestibility and decreases in the capacity for directed and concentrated thought and problem solving. But few experienced the hallucinations and the severe emotional effects reported in Hebb's and other similar investigations. Indeed, there is evidence, not quoted in this book, to suggest that the effects of homogeneous or meaningless random sensory stimulation may be more severe than those of lack of stimulation.

Investigations of this kind were originally undertaken at least partly in the hope that they might throw some light on the effects of 'brain washing' of political prisoners, and on airmen of space travel. The author very properly says that the conditions in his experiments were so different from those of 'brain washing' and space travel that the results of the former are hardly applicable to the latter. Among other things, the subjects of his experiments were all highly paid volunteers, who could terminate their incarceration when they wished. Yet he makes a number of highly speculative inferences from his findings about the possible outcome and control of the effects of 'brain washing.' More appropriate and more interesting might have been some application of the findings to modern industrial conditions such as those of windowless office and workshops. But here of course it is the effects of constant homogeneous stimulation rather than lack of stimulation which are relevant.

One fact which emerges from all studies of 'sensory deprivation' is that some people can tolerate it much better than others. But in spite of numerous comparisons of the personality characteristics of the two types of individual, little is known with any certainty about these. The somewhat unbalanced individual, obsessed by his own anxieties, is likely to show poor tolerance; and so also, according to the author, are those characterized by the tendency to 'concrete' rather than 'abstract' thinking; but it is difficult to understand quite what is meant by this dichotomy, and it requires much fuller investigation.

Theories put forward to explain the nature and causes of the experiences in conditions of 'sensory deprivation' are at the moment highly speculative, and the author is necessarily cautious in discussing these. It would perhaps have been preferable had he reduced his speculative predictions to a minimum, and confined himself to describing the factual data obtained both by himself and also by other experimenters. More references to the sources of the latter should have been included; and also an index.

M. D. VERNON

The Structure and Measurement of Physical Fitness and the Examiner's Manual for the Basic Fitness Tests. By E. A. FLEISHMAN. Englewood Cliffs, New Jersey: Prentice Hall, 1964.

Dr Fleishman is best known for his research into motor skills. However in this book he presents the enormous amount of work he has done in the field of physical fitness. Using factor analysis of the results of the large scale administration of a great variety of physical proficiency tests he has made a significant contribution to the clarification of that diffuse expression 'physical fitness.'

First of all he reviews previous factor analysis studies and labels factors which appear consistently. From this review it is clear that there is no single physical fitness factor, as consideration of work done in five broad ability areas, namely strength, flexibility-speed, balance, coordination and endurance identified some fourteen factors.

The first large scale study undertaken was to apply 30 tests of strength and endurance to 200 Navy recruits, and this led to confirmation of the importance of four factors (static, dynamic, explosive and trunk strength) in accounting for the performance of the 30 tests. In addition 30 tests of flexibility, speed, balance and coordination were administered to a further 200 Navy recruits and this resulted in the definition of a further five factors namely extent and dynamic flexibility, gross body equilibrium, balance with visual cues and speed of limb movement.

The next step was to select 14 tests which best covered nine basic factors for the major study to obtain national standards. It is certainly impressive that results were obtained from over 20,000 boys and girls in 45 different cities throughout the United States, enabling test standards to be laid down for each age group and sex from 15 to 18 years and less completely for the lower age groups down to 12 years.

The stated overall objectives of this research were to identify the components of physical proficiency and to recommend appropriate test procedures for their measurement. These objectives can be seen to have been largely achieved. In view of the fact that some 100 tests were pruned down to a final battery of 10, selection depending on such criteria as factor loading, purity and reliability, one can have confidence that the selected tests are at least the best available of this type. Dr Fleishman makes it quite clear that he has assumed physical fitness to be a desirable objective in its own right and emphasises that further research must be done to assess the predictive value of these tests into such qualities as good health, long life and athletic achievement.

The author refers to the studies of Kraus and Hirschland (1954) who reported the inferiority in physical proficiency of American compared to European youth, and shows that their tests sampled only two of nine possible physical fitness factors. However he does concede, in comparing his national norms with data collected in England and Australia that stamina is a factor in which the American youth is consistently inferior.

The Examiner's Manual is a condensed version of the book and sets out full details of the battery of ten tests finally recommended. On the practical side the test record sheets, fitness profile charts and development record are all well thought out and should be very easy to use.

This book will undoubtedly be of great value to the physical educator and others interested in assessing the physical fitness of well motivated individuals.

M. F. HAISMAN

Social Psychology in Treating Mental Illness: An Experimental Approach. Edited by GEORGE W. FAIRWEATHER. New York: John Wiley, 1964. Pp. xii+300. Price 60s.

During the past few years Wiley have published some very worthwhile volumes in the field of general psychology. This is no exception. In essence it is a report of a prolonged social experiment rather than a theoretical discussion of general issues, and for this reason much of the book reads like a very protracted scientific paper, especially throughout Section II which consists of seven chapters containing in effect the 'results' data of the experiment. The subsequent sections are more discursive and because they are less interrupted by figures and tables somewhat more readable.

Broadly speaking, what Dr Fairweather and his psychologist co-workers have aimed at is the experimental establishment and validation of some social psychological techniques in chronic patient wards of a mental hospital. In particular, they are trying to rehabilitate the chronic neurotic and especially the chronic schizophrenic so that he remains effective in the community after discharge. It is argued that the chronic patient has to be weaned away from his over-dependent role in hospital to adopting individual and group roles and statuses which better match those relevant to community survival. Accordingly, Fairweather created an experimental ward organisation of 'problem-solving task groups' of patients and matched the performance and follow up of this 'small group' population against that of a 'traditional ward' population of similar patients. The book asks two main questions: '(a) Can small problem-solving groups of mental patients be formed and, if so, how does a program organized around small groups differ from a more traditional program? (b) If cohesive problem-solving groups can be created, what are their parameters?' (p. 26). Both these questions are answered, the first more comprehensively than the second perhaps, and the answers are supported by a wealth of data before which the authors must have boggled until it was thoroughly computer processed with the help of Dr R. C. Tryon. Non-parametric techniques, analysis of variance and covariance and factor analysis all are effectively and systematically used to support a methodologically sound experimental design.

Because of the range and complexity of the data assessed in a study of this sort, the lay-out of the book is obviously important, the more so since at least nine or ten contributors are responsible for successive chapters. It says much for the Editor that the quality of the writing is so even, direct and clear in spite of its rather arid technical journal style. Interestingly enough, the chapters written by nurses and social workers show less of this and read more briskly in consequence.

Section I gives the History and Description of the Study (42 pages); Section II, as indicated above, is a Comparison of Treatment Programs and Diagnostic Groups (126 pages); Section III discusses Group Processes (41 pages); Section IV deals with The Effect of Changing the Social System upon Attitudes of Staff Personnel (60 pages) and finally Section V gives in brief The Future of Socio-Clinical Treatment Programs for Deviant Groups (17 pages). Sections III and IV are specially rewarding and helpful to anyone practically concerned with hospital rehabilitation and indeed this is a book which such a person should not fail to read. He will find that by doing so many errors of organisation may be avoided. Pertinent comment needs little searching for. For example, while acknowledging the work of Maxwell Jones and Rapoport, Fairbrother remarks how some hospitals regard the occasional large ward meeting "as the hallmark of the therapeutic community, but instead of changing the ward's social organisation, this meeting was merely added to the ward schedule as another activity" (p. 15). However, conditions here and in the typical Veterans Administration Hospital in U.S.A. are far from parallel in numbers and type of staff, in patient freedom, in the geography of patient's domicile and in the nature of out-of-hospital social agencies, and modifications in the programs outlined by the authors would be necessary in the United Kingdom.

In many ways it is depressing that after all their hard work and three years of experiment the authors have to admit on p. 284 that 'there still remains the problem of recidivism, for 56% and 58% of the non-psychotic and most chronic psychotic patients, respectively, had returned to the hospital within six months following discharge". They conclude that the "locus of future treatment programs must be the community", something toward which British mental hospital care has been orienting itself now for a decade. Nevertheless the process of rehabilitation begins with the illness, in hospital, and the writers have shown a nice balance of rigour, awareness of detail and enthusiasm in attempting to mediate the patients' social environment in a positive way.

Main criticisms would be that the authors have done an awful lot of work for relatively few conclusions of wide value and secondly that preoccupation with their experiment has prevented them from formulating a theoretical position which takes enough account of the intra-individual parameters of social activity. Otherwise the book deserves careful consideration by all concerned with rehabilitation and hospital administration. Although a product of considerable technical expertise it does not necessarily demand this of its readers and it has certainly been very thoroughly proof read. Only on trifling misprint could be detected in its 300 pages.

D. F. CLARK

The Organizational Society; An Analysis and a Theory. By ROBERT PRESTHUS. New York: A. A. Knopf, 1962. Pp. xii+323. Price 48s.

"This book concerns the influence of social values and bureaucratic structure upon members of the big organisations that pervade our society. More specifically, it attempts to define the patterns of individual accommodation that occur in the bureaucratic milieu . . . Does organisational logic enhance the survival changes of our society or does it limit our ability to meet the demands of change in a swiftly changing world?"

So begins this book, a book in which the author is concerned to show that the bureaucratic nature of many of the larger organisations is hampering the United States in its competition with Russia. In illustration of his thesis, the author ranges far and wide. Chapters are devoted to the nature of large organisations, to their growth in numbers over the last century or so, to Weberian and other models of bureaucracy and to theories of socialisation and personality development. The author is immensely detailed and painstaking — there are over 300 names in the index, for instance — but the central contention is plain enough. Almost too plain, in fact: it is simply that organisations tend to be authoritarian in structure and as a result the members that get to the top tend themselves to be hostile to innovation.

This position is buttressed by a veritable battery of evidence. The book is 323 pages long and there is hardly a page without its meed of quotations. But, one may ask, what does this all amount to? To show that competition can lead to conformity is so obvious as to hardly need stating and yet the author does not seem to show very much more. He is in fact more interested to show when his thesis holds than he is to show the more interesting question of when it does not hold. Presumably there are cases when it need not hold: if the process were inevitable it would be useless to write books about it. But this all important area is not explored.

The problem of causality is always a difficult one in the social sciences but it would be consoling to see that the author was alive to the difficulties. But this he does not really seem to be. Problems such as, Do nonconformists not get ahead because they are nonconformist or are they nonconformist because they do not get ahead?, are not touched. The very erudition seems to get in the way here. Just because something is said four times does not mean that it is the more frequently true. The author sometimes goes to almost absurd lengths (thus the unexceptionable contention that individuals differ amongst themselves even when brought up in the same environment takes a whole page of text and half the page of footnotes, close type, and four quotations to prove) and yet is unaware of the limitations of the point of view put forward. Truths are stated too baldly and so lose their edge.

And why should this be? Oddly enough it would seem that this thesis in praise of originality is itself immensely conformist. The tacit assumption would appear to be that precedent will legitimate and that the more it has been said before, the less need there is to qualify the conclusions or to place them in relational, contextual terms. This timidity and baldness is most apparent in the last chapter, the chapter that directly deals with the need for originality is itself almost half quotations.

But the erudition is there and there is no doubt that Professor Presthus has covered a great deal of ground and has clearly expounded a very important point of view. Moreover he has attempted an interdisciplinary approach, always notoriously difficult. As he himself somewhat glumly remarks, "Unless one has experienced graduate training and apprenticeship in American higher learning, the stress involved in broadening one's approach beyond a single discipline is hard to imagine. Academic training instills a compelling inhibition against venturing beyond a given segment of knowledge. The underlying reason is the passionate specialisation of university organisation." There seems to be little doubt that, at least in academic America, competition leads to specialisation and increasing conformity.

ROGER HOLMES

Social Deviance. By LESLIE T. WILKINS. London: Tavistock, 1964. Pp. xv+311. 45s.

The sub-title of this book is "Social Policy, Action, and Research." It has been written by the Reader in Social Survey Methods at the new University of Strathclyde. It is an important book which should be carefully studied by anyone interested in social deviance and the social action which might be taken to deal with it. It is written in uncomplicated terms with a refreshing absence of unnecessary jargon. It should be immediately understandable to the intelligent layman while remaining stimulating to the more sophisticated professional worker.

Mr Wilkins proposes a general theory of deviance, which is itself of the greatest interest, and suggests how data might be collected on which to base social action. He discusses the problems of communication between those who frame social policy, those who take social action and those who seek and obtain relevant research data on which such action might be based. This analysis is made in terms of information theory, enquiring how people and organisations receive and process information and how they decide to act on the basis of this information.

It is not possible, in a short review, to comment on much of the material in this book: the present reviewer must content himself with one point which stimulated him. This was the discussion about the rival claims of ethics (rightness and wrongness) and effectiveness (does it work or does it not?). Mr Wilkins argues, correctly, that to say a course of action must be effective because it is right, is unsound. The question of effectiveness, he points out, is one answerable by facts which can be ascertained, not by opinions as to rightness and wrongness. He then asks: "If we have no information of the outcome, how can we make sound ethical judgments?" But this is not the same problem. As Mr Wilkins says, questions of effectiveness are not questions of ethics. He cannot now reverse this proposition and assert that questions of ethics depend on facts about effectiveness. Although value judgements of "rightness" and "wrongness" could be dependent on effectiveness, they are not necessarily so. For example, while an ethically acceptable means could be wrong if it were shown to lead to a bad end, an ethically unacceptable means does not become right because it can be shown to lead to a good end. Thus if flogging all prisoners were shown to lead to their all living good lives thereafter, this would not be an ethical justification for adopting this mode of treatment. Killing all children of parents who already had two would solve the population problem, but it would not therefore necessarily be right, however effective.

Mr Wilkins is surely right when he says that the costly business of social action should not be left to chance if the situation can be scientifically studied. Nevertheless if ethical considerations are involved, they are not necessarily tied to questions of effectiveness. The ends do not always justify the means.

RALPH HETHERINGTON

Psychology and Social Problems. By MICHAEL ARGYLE. London: Methuen, 1964. Pp. 232. Price 25s.

The centre piece of this book summarises in barely seventy pages psychological research done durng the last fifteen years or so on the following problems: aggression, delinquency and crime, mental health and mental disorder, racial and international attitudes, and human problems in industry. To deal with so much in so little space can mean one of three things: either there is little relevant work to be summarised (but actually there is a lot); or the treatment is superficial; or the author has a remarkable skill in presenting the essentials of psychological work. It would be pleasant to settle for the third alternative only. Argyle has indeed great ability in exposition, he writes in a readable if somewhat breezy style which is free both from unnecessary jargon and from false shame about using technical terms, and there is no doubt that he has a thoroughly competent knowledge of the literature.

The discussion of the five major social problems is preceded by a section entitled The Elements of Social Behaviour (personality, motivation of social behaviour and interpersonal behaviour) and followed by two sections, one on processes of social control and the other on social change. Each part is full of interesting information and brief but adequate summaries of relevant research. Altogether the book offers the intelligent layman a glimpse into the psychologist's workshop, describing his plans, some of his tools and his product.

This is all to the good, for there can be little doubt that one of the major reasons for the delay in using psychology, and the social sciences in general, in the execution of social policy is widespread ignorance of their methods, theories and findings. And yet, there is something about the easy optimism of this book which may outweigh some of its assets. Argyle argues enthusiastically that "just as economists can control the economy, so social scientists are now in a position to control society." Quite apart from the fact that it is not the economist who controls the economy but the policy maker; quite apart from the fact that economic policy is in any case to a large extent social policy; and quite apart from the fact that the economist is often severely handicapped by lack of psychological knowledge, this is simply not true. Social scientists cannot control delinquency, teen-age riots, racial antagonism, industrial productivity or methods of rearing children, even though they have valuable contributions to make on each of these issues, including Argyle's own technical work. Much as one agrees with Argyle's intention, his arguments here are superficial. Neither society nor psychology will be served in the long run by substituting good intentions for an adequate view of man, society and the historical process of change in their full complexity.

Postscript: many psychologists will raise their eyebrows at being told that "attitudes and beliefs are partially inherited".

MARIE JAHODA

Pavlov's Typology: Recent Theoretical and Experimental Developments from the Laboratory of B. M. Teplov. Edited by J. A. GRAY. London: Pergamon, 1964. Pp. xv+480. Price 84s.

The main title of this book might mislead in its suggestion of mainly historical interest. In fact, its greatest appeal is likely to be to those concerned with behaviouristic approaches to the analysis of personality.

In Part I Professor Teplov gives an account of the historical development of Pavlov's attempts to understand the temperamental differences between the dogs used in his experiments, and reviews the theoretical developments and research findings of more recent years. Part II is written by Mr Gray, and describes the application of this typology at the human level through a review of the experimental work carried out in Teplov's laboratory at the Institute of Psychology, Moscow. The author then goes on to make a very valuable attempt to present the Russian work on the strength of the nervous system in the more familiar terminology — to Western psychologists — of 'levels of arousal.' Finally, Part III consists of five translations of important experimental reports from Teplov's laboratories.

The most puzzling feature of the Russian work is the persistence of a very simple model of the nervous system. Through several decades results are discussed in terms of the properties of the cortical cell. Mr Gray comments that this is because the theory of strength of the nervous system is essentially behavioural and introduces hypothetical neural entitles only in order to clarify the relationships demonstrated experimentally. Certainly, this is confirmed in the ease with which the Russian work is transposed into the terms of arousal theory, an equally behavioural formulation. However, Mr Gray also examines this transposition in the light of the known functions of the reticular system, and although this necessitates some speculative reasoning it adds a new dimension of interest, credibility and heuristic value.

The work reported is at a level of development of direct value to those with relevant research interests and laboratory facilities. Nevertheless, there are many points of methodology and orientation of more general interest. In his editorial introduction Professor Eysenck points out the Russian concern with the individual case which deviates from a general trend, a technique Western psychologists tend to regard as more appropriate to the clinic than the laboratory. In the first part of the book Professor Teplov comments, "First of all, it should be said how futile, and perhaps even how harmful in the present state of our knowledge, are attempts to find 'quick' methods of determining the type of nervous system in Man, i.e. methods which require in all only a few days, or even a few hours." So much for our questionnaires!

I. J. MCKISSACK

Approaches, Contexts, and Problems of Social Psychology. Edited by E. E. SAMPSON. New Jersey: Prentice Hall, 1964. Pp. ix+576. Price 72s.

What do we expect of a good collection of readings? It should represent the field and yet reflect the idiosyncratic insight of the editor. It should have structure and form but remain accessible to random dipping, range extensively but not at the expense of depth. In fact, it needs to be an *anthology* of information that is interesting to read.

These are high ideals, but Sampson's Readings (to use the easier vernacular title that it will undoubtedly assume) measures up very well. The most noticeable shortfall is in its representativeness, but more of that later.

The collection includes 44 unabridged papers, almost all of them journal articles. Their modernity is impressive. The average year of original publication is 1959/60 and would be higher if the mean were not unbalanced by one antique piece from 1948. Approximately half are from psychological journals, half from the main journals of American sociology. The differences in style and quantification from these two sources which would have been obtrusive 10 years earlier, have largely disappeared.

The *Approaches* of the title are linguistic and cognitive, inter-personal perception; interaction and influence; motivation and emotion; socialisation, role taking and the self concept; the attitude. Part 2, the *Contexts* cuts across these with sections on the small group; large scale organisation; community; culture and society. A third major part, the *Problems*, comprises only 10 per cent of the total, and since the treatment is necessarily thin it might have been better to narrow the scope and leave it out. Its exclusion would have made the structure clearer, the title neater and the book cheaper and lighter (it weighs almost 3 pounds), about the same as Woodworth and Schlosberg).

The linking material is relatively sparse. One or two pages of introduction to each section and, somewhat unpredictably, a paragraph here and there for individual articles.

If there is a bias it is for the theoretical paper. More than half are of this kind and others include a good deal of explanatory supportive tissue. There is little of what we have come to regard as basic introductory material. No easy papers that 'spell out social psychology for the beginning student.' The image is more sophisticated, hardened — sometimes obscure. A first reaction will be to reserve it for the advanced, if not for the post-graduate, student. But this is a relative judgment and more detachment might lead us to reflect that the introductory patterns we have been obliged to offer in social psychology have been a trifle too homespun to be taken very seriously. The Honours student, then, could profit in motivation as well as learning by meeting this book early. This is not to say that it is suitable for the numerous vocational courses that now include a portion of psychology. In particular, there is none of the applied approach to social aspects of productivity that would be required for industrial management courses, there is a little on social pathology, but nothing on education or training. Briefly, then, a very useful book for University teaching, a good but not complete purview of the social field for the professional and a source of encouragement for the social psychologist.

TERENCE LEE

Other Books Received

Compensatory Adaptations. Reflex Activity and the Brain. By EZRAS A. ASRATIAN. London: Pergamon, 1965. Pp. xv+194. Price 80s.

Domestic Accidents. By E. MAURICE BACKETT. Public Health Papers, number 26. Geneva: World Health Organization, 1965. Pp. 137. Price 10s.

Exercises in Business Decisions. By J. N. FAIRHEAD, D. S. PUGH and W. J. WILLIAMS. London: English Universities Press, 1965. Pp. xiii+218. Price 37s. 6d.

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Communications in the Building Industry: the Report of a Pilot Study. By GURTH HIGGIN and NEIL JESSOP. Tavistock, 1965. Pp. 125. Price 25s. Paperback 12s. 6d.

Principles of Training. By D. H. HOLDING. London: Pergamon, 1965. Pp. xvi+156. Price 17s. 6d.

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Information, Influence and Communication. Edited by OTTO LERBINGER and ALBERT J. SULLIVAN. New York: Basic Books, 1965. Pp. xii+513. Price 60s.

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Organizational Psychology. By EDGAR H. SCHEIN. Englewood Cliffs, New Jersey: Prentice Hall, 1965. Pp. xi+114. Price 32s. Paperback 12s. 6d.

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A Study of Supervisors in the Iron and Steel Industry

By PETER B. WARR, MICHAEL W. BIRD

Department of Psychology, University of Sheffield

and RAYMOND W. HADFIELD

British Iron and Steel Federation

SOME studies of the characteristics and behaviour of supervisory staff (for example, National Institute of Industrial Psychology, 1951; Thurley & Hamblin, 1963) have been designed to obtain information about supervisors from a wide range of technological environments. They have made possible comparisons and contrasts between small numbers of foremen in different industries. It is clearly necessary that such 'between-industry' studies should be supplemented by 'within-industry' studies of a more intensive kind.

The present report describes an investigation of supervisors in the iron and steel industry in the Sheffield, Rotherham, North Derbyshire and Scunthorpe areas. We have approached all iron and steel firms in this region which are federated to the British Iron and Steel Federation. These federated firms comprise over 95% of the iron and steel companies in the region. The investigation was undertaken in order to obtain valid general information about the supervisory population in this limited sector of industry. Such information is to be used as a basis for decision making about the development of supervisory training schemes. No details were previously available of the number of supervisors involved, let alone of their backgrounds. Apart from gathering data for practical application, the investigation was also intended to provide average figures representative of this limited sector of industry, comparable with figures obtained from similar investigations of other sectors when these become available.

METHOD

A questionnaire was distributed to the 106 local firms which are members of the British Iron and Steel Federation (BISF). This was sent out from the BISF local office in April, 1964. A covering letter described the purposes of the study and drew attention to the problem of defining levels of supervision.

Respondents were asked to make use of a suggested grading scheme. This divided supervisory staff into three categories:

Senior foreman, directing and co-ordinating the activities of other foremen, linking these with higher management.

First-line foreman, regarded by operatives as their immediate superior, with direct formal authority over them for both operational and disciplinary matters.

Chargehand, combining supervisory with operative duties and probably engaged primarily on the latter, with responsibility being largely confined to organizational rather than disciplinary matters.

The questionnaire was in three parts:

The first section asked how many supervisors of each grade were employed in each of several types of department. The set of departmental categories used is shown in Table 1. Information was also sought about the numbers of each grade of supervisor appointed to each type of department in 1962, in 1963, and in the first part of 1964.

The second part of the questionnaire was concerned specifically with first-line foremen appointed since January, 1962. We were particularly interested in this group, since its members are of most immediate concern from the standpoint of supervisory training. Companies were asked to provide more detailed information about each first-line foreman appointed since January, 1962. Several multiple-choice questions were provided, and the questionnaire was designed so that information about a single foreman was recorded in each column. Details were obtained about date of appointment, age on appointment, department to which appointed, previous job, educational background and qualifications, status within the firm, number of employees supervised, and supervisory training received. Each foreman was identified only by a number, but firms were requested to keep a record of the name of the person described in each column. This was in order that the individual might be identified for an interview at a later stage of the research project. The interview stage will be reported in another paper.

The final section of the questionnaire comprised three open-ended questions about the training of supervisors. These questions are being followed up in interviews, and results from this section of the questionnaire will not be considered here.

RESULTS AND DISCUSSION

General Findings

Completed questionnaires were obtained from 70 companies. All the non-responding firms were small ones. We have estimated the number of supervisors in the non-responding companies by pairing each of these firms with a similar one from which data are available. It is estimated that approximately 90 chargehands, 60 first-line foremen and 20 senior foremen are employed in the companies which failed to return the questionnaire. These estimates are not included in the figures presented here. On the basis of the estimates we believe that the

Size of Firm (No. of employees)	Number of Firms represented	Departments								TOTALS
		Iron & Steel Making	Foundry	Rolling	Forging	Engin-eering	Other production depts.	Main-tenance	Other Depts.	
Less than 250	29	C 8 F 2 S 1 A 11	C 1 F 1 S 1 A 3	C 16 F 14 S 6 A 36	C 23 F 4 S 5 A 32	C 2 F 5 S 0 A 7	C 17 F 9 S 4 A 30	C 16 F 7 S 3 A 26	C 24 F 13 S 6 A 43	C 107 (57%) F 55 (29%) S 26 (14%) A 188
250-1,000	22	C 6 F 25 S 5 A 36	C 14 F 14 S 3 A 31	C 19 F 31 S 8 A 58	C 14 F 7 S 3 A 24	C 28 F 48 S 9 A 85	C 72 F 73 S 15 A 160	C 38 F 45 S 8 A 91	C 23 F 36 S 7 A 66	C 214 (39%) F 279 (51%) S 58 (10%) A 551
1,001-5,000	12	C 48 F 62 S 34 A 144	C 53 F 31 S 27 A 111	C 56 F 59 S 18 A 133	C 20 F 38 S 14 A 72	C 63 F 78 S 22 A 163	C 82 F 116 S 28 A 226	C 149 F 135 S 54 A 338	C 102 F 113 S 30 A 245	C 573 (40%) F 632 (44%) S 227 (16%) A 1432
5,001-8,000	4	C 98 F 83 S 26 A 207	C 0 F 0 S 0 A 0	C 58 F 118 S 28 A 204	C 17 F 9 S 4 A 30	C 9 F 23 S 7 A 39	C 90 F 80 S 18 A 188	C 175 F 221 S 100 A 496	C 25 F 96 S 23 A 144	C 472 (36%) F 630 (48%) S 206 (16%) A 1308
More than 8,000	3	C 11 F 126 S 22 A 159	C 5 F 26 S 5 A 36	C 102 F 144 S 20 A 266	C 6 F 53 S 11 A 70	C 2 F 42 S 9 A 53	C 6 F 28 S 3 A 37	C 166 F 335 S 46 A 547	C 52 F 113 S 5 A 170	C 350 (26%) F 867 (65%) S 121 (9%) A 1338
TOTALS	70	% C 171 (31) F 298 (53) S 88 (16) A 557	% C 73 (40) F 72 (40) S 36 (20) A 181	% C 251 (36) F 366 (52) S 80 (12) A 697	% C 80 (35) F 111 (49) S 37 (16) A 228	% C 104 (30) F 196 (56) S 47 (14) A 347	% C 267 (42) F 306 (48) S 68 (10) A 641	% C 544 (36) F 743 (50) S 211 (14) A 1498	% C 226 (34) F 371 (55) S 71 (11) A 668	C 1716 (36%) F 2463 (51%) S 638 (13%) A 4817

TABLE 1: SUPERVISORY STAFF EMPLOYED IN THE SECTOR UNDER INVESTIGATION. C=CHARGEHANDS; F=FIRST LINE FOREMEN; S=SENIOR FOREMEN; A=ALL SUPERVISORY STAFF

supervisors described below constitute some 97% of those employed in the sector under investigation.

A summary of the information obtained from the first part of the questionnaire is presented in Table 1. In this table we have indicated the number of supervisors in each grade according to type of department and size of firm. Of the 4,817 supervisors detailed in Table 1, 36% are chargehands, 51% are first-line foremen, and 13% are senior foremen. It is interesting that, although these percentages do not differ greatly between departments, the distribution of kinds of supervisor varies with size of firm. For example, some 57% of the supervisors employed in the smallest category of firms are classed as chargehands and only 29% as first-line foremen. These figures are 26% and 65% respectively for the largest firms.

The large number of maintenance foremen is another noteworthy feature of the data in Table 1. Their training needs may differ from those of other foremen. Conversely, it is found that only 55% of supervisors are employed in production departments.

We have calculated the number of supervisory staff per 100 employees in each company. Over the whole sample this value is 4.9. The average number of chargehands per 100 employees is 1.8; for first-line and senior foremen these values are 2.5 and 0.6 respectively. It seemed probable that these ratios would vary with size of firm, and we have tested this by calculating rank correlations (*rho*) between each ratio and size of firm. None of these correlations are statistically significant. The correlation between the ratio for *all* supervisory staff and size of firm is −0.18, which indicates a very slight tendency for larger firms to employ proportionately fewer supervisory staff. Correlations of this kind for chargehands, first-line foremen and senior foremen are −0.22, +0.05 and +0.08 respectively.

Size of firm is a variable commonly studied in investigations of this kind. It is possible that this sometimes leads to misleading interpretations since several other attributes covary with size. For example, the larger firms typically make a wider range of products. We have obtained from details provided by BISF an index of diversity (the number of types of product made by a firm), and have related this to company size. It is found that the correlation (*rho*) between size and diversity is +0.70. Although, therefore, we shall make reference to variations in company size, it should be borne in mind that differences in other measures are not necessarily due to these size variations alone.

Newly appointed foremen

From the replies to the second part of the questionnaire we have been able to study in some detail the backgrounds of the 453 first-line foremen appointed between January, 1962, and the middle of 1964. Several interesting relationships between the characteristics of these foremen and other variables have emerged. Each of the major variables investigated is discussed below.

1. *Date of appointment*

We have compared the date of appointment of each foreman with the other factors about which information was obtained. These other variables include size of firm, type of department, school attended, qualifications held, age on appointment, previous job, number of employees supervised, training received and status in the firm. There is no evidence that date of appointment is systematically related to any of these characteristics over the limited period of the study.

2. *Type of Department*

There are a number of clear differences between foremen appointed to different types of department. For example, age on appointment differs significantly between departments. Although the majority of the foremen are appointed below the age of 45, there is a significant tendency for the younger ones to be appointed to iron and steel making, rolling, maintenance or engineering departments. This tendency, which is statistically very significant ($p < 0.001$), is summarised in Table 2. All significance levels cited here and subsequently are based upon chi-square tests.

Department to which appointed	Age on appointment			N
	under 35	35-44	over 44	
Iron and Steel Making	42%	32%	26%	74
Rolling	40%	37%	23%	97
Maintenance and Engineering	39%	44%	17%	150
All other Departments	26%	45%	29%	132
N	163	184	106	453

TABLE 2: THE RELATIONSHIP BETWEEN AGE ON APPOINTMENT AND THE DEPARTMENT CONCERNED

In addition to this, iron and steel making and rolling departments tend to draw more of their foremen from outside the section they are to supervise ($p < 0.001$).

Department to which appointed	Previous Place of Work			N
	Same Company		Another Company	
	Same Department	Different Department		
Iron & Steel Making	61%	20%	19%	74
Rolling	65%	23%	12%	97
Maintenance & Engineering	83%	8%	9%	150
All other departments	78%	18%	4%	132
N	335	74	44	453

TABLE 3: THE RELATIONSHIP BETWEEN PREVIOUS PLACE OF EMPLOYMENT AND THE DEPARTMENT TO WHICH SUPERVISORS ARE APPOINTED

Although in other kinds of department some 80% of foremen are appointed from within their own department, this figure is much lower for iron and steel making and rolling supervisors. The latter are also more likely to have been appointed from another company. This tendency ($p < 0.001$) is shown in Table 3, in which the previous employment of all newly appointed first-line foremen is tabulated.

The educational background of the foremen appointed to these two kinds of department (iron and steel making and rolling) is also significantly different from that of other foremen. Whereas 13% of foremen appointed to the former two departments had attended technical or grammar school until the age of 17 or 18, only 3% of other foremen had received this form of education. The number and type of qualifications obtained by foremen are distributed in a similar fashion. This point will be considered in more detail below.

The number of employees supervised by a foreman is also found to vary between departments. This relationship is shown in Table 4, and a chi-square test indicates that it differs significantly between departments ($p < 0.001$). It can be seen that the major difference here is between maintenance and engineering foremen and those employed in other departments. A much higher proportion of the former group are in charge of work-groups composed of fewer than ten employees.

Department to which appointed	Number of Employees Supervised			N
	Less than 10	10-30	More than 30	
Iron & Steel Making	13%	58%	29%	74
Rolling	7%	65%	28%	97
Maintenance & Engineering	28%	51%	21%	150
All other departments	17%	51%	32%	132
N	81	249	123	453

TABLE 4: THE RELATIONSHIP BETWEEN NUMBER OF EMPLOYEES SUPERVISED AND THE DEPARTMENT TO WHICH SUPERVISORS ARE APPOINTED

It is clear, then, that several of the observed characteristics of newly appointed foremen vary between departments. These variations are sometimes linked to the size of the company in which a foreman is employed, in that, for example, iron and steel making and rolling departments are predominantly in larger firms. The importance of size variations is considered in detail below.

3. *Age on Appointment*

We have clear evidence that the younger foremen tend to be more mobile than the older ones. This tendency ($p < 0.001$) is shown in Table 5. Whereas about 80% of newly appointed supervisors aged 35 or older are promoted from within the same department, only 63% of younger ones were previously employed in their present department. Twenty-three per cent of younger super-

Age on Appointment	Previous Place of Work			N
	Same Company			
	Same Department	Different Department	Another Company	
Under 35	63%	23%	14%	163
35-44	79%	14%	7%	184
Over 44	82%	11%	7%	106
N	335	74	44	453

TABLE 5: THE RELATIONSHIP BETWEEN PREVIOUS PLACE OF EMPLOYMENT AND THE AGE AT WHICH SUPERVISORS ARE APPOINTED

visors came to the job from other departments of the firm, and 14% were appointed from other companies.

These younger supervisors tend to have had a better education and to possess more qualifications than their older colleagues. This is of course partly due to changes in educational opportunities over the past decades throughout the country as a whole. A longer full-time education is now more common, and in addition to this many companies now encourage their younger employees to take advantage of part-time educational courses. We were interested in whether foremen currently being appointed had on average received better education than the population as a whole, and were able to test this by comparing the percentage of foremen in each age group who had received technical or grammar school education with the proportion of the general population educated at these types of school. This latter information was provided by the relevant local education authorities, and the comparison is shown in Table 6. The figures for the general population are only approximate, but the difference between our sample and the population is extremely great. It is clear that this sample of first

Age	Percentage of foremen going to technical or grammar school	Approximate percentage of general population going to technical or grammar school
Under 35	54	18
35-44	21	13
Over 44	9	3

TABLE 6: COMPARATIVE PROPORTIONS OF NEWLY APPOINTED FIRST LINE SUPERVISORS AND THE GENERAL POPULATION IN THE AREA WHO RECEIVED TECHNICAL OR GRAMMAR SCHOOL EDUCATION

line foremen has received a significantly better formal education than the population as a whole.

4. *Qualifications*

It was mentioned above that the younger foremen tend to be more mobile and to have significantly better qualifications. The percentage of foremen having each kind of qualification is of interest for comparison with other samples. Overall, 30% of foremen possess one or more qualifications. The proportion of foremen possessing each of the qualifications investigated is shown in Table 7. The values in this table sum to 40, since some supervisors hold more than one qualification. Apart from these qualifications, 41% of all newly appointed foremen have served a craft apprenticeship, of whom 79% are employed in Maintenance, Engineering or Foundry departments.

Qualification	%	Qualification	%
Degree, H.N.D. or Dip. Tech.	2	City & Guilds Craft Certificate	5
Member of Professional Body	1	City & Guilds Operatives Certificate	6
H.N.C.	2	Foremanship or Management Certificate	4
O.N.C.	7	G.C.E. or School Certificate	13

TABLE 7: PROPORTION OF THE SAMPLE OF FIRST LINE SUPERVISORS POSSESSING EACH QUALIFICATION

5. *Size of Firm*

Several striking differences emerge between foremen appointed in firms of different sizes. There is, for example, a significant tendency ($p<0.001$) for the small companies (less than 1,000 employees) and the large companies (more than

Size of Firm	Previous Place of Work			N
	Same Company		Another Company	
	Same Department	Different Department		
Less than 1,000	65%	22%	13%	68
1,000-5,000	81%	10%	9%	101
5,001-8,000	86%	9%	5%	120
More than 8,000	65%	23%	12%	164
N	335	74	44	453

TABLE 8: THE RELATIONSHIP BETWEEN PREVIOUS PLACE OF EMPLOYMENT AND THE SIZE OF THE FIRM IN WHICH SUPERVISORS ARE APPOINTED

8,000 employees) to make fewer appointments from within the same department. Data relevant to this point are summarized in Table 8.

Another similarity between foremen in the small and the large firms is in the number of employees they supervise. Whereas only 11% of the newly appointed foremen in companies employing between 1,000 and 8,000 people supervise fewer than 10 employees, 28% of foremen in the smaller firms and 23% of foremen in the larger firms supervise this small number.

We had expected the age at which foremen were appointed to vary with size of firm. And there is a slight tendency for the large companies (more than 8,000 employees) to appoint younger supervisors. This tendency is just significant ($p < 0.05$). In view of the large numbers involved and the low level of significance, however, this evidence is not adequate support for the hypothesis. Further work is required before any clear conclusions can be drawn.

There are however interesting differences between the large companies and smaller ones in the educational background and qualifications of the persons appointed to supervisory positions. These differences ($p < 0.001$) are shown in Table 9. Persons appointed in the larger firms are more likely to have been to technical or grammar school and to possess one of the qualifications referred to in Table 7. It is likely that this is a consequence of differences in selection and/or training policy between larger and smaller companies.

Size of Firm	Technical or Grammar till 17-18	Technical or Grammar till 15-16	Secondary Modern	N	Holding a qualification
Less than 1,000	10%	18%	72%	68	22%
1,000-5,000	5%	14%	81%	101	17%
5,001-8,000	4%	20%	76%	120	30%
More than 8,000	9%	34%	57%	164	43%
N	32	109	312	453	—

TABLE 9: THE RELATIONSHIP BETWEEN EDUCATIONAL BACKGROUND AND THE SIZE OF THE FIRM IN WHICH SUPERVISORS ARE APPOINTED

We have obtained information about whether newly appointed foremen are granted staff status. Although 93% of the sample hold a staff appointment, there are significant ($p < 0.001$) variations between companies of differing sizes. Whereas 99% of newly appointed supervisors in firms employing more than 3,000 employees hold a staff appointment, only 72% of those in firms smaller than this are described as members of the staff.

6. *Training Received*

The questionnaire requested details of training received by each newly appointed foreman prior to his appointment. Replies indicate that 46% of the sample had been employed for 3 months or more as a trainee foreman or chargehand. Internal company training had been provided for 32% of the sample, and

7% had previously attended external training courses (organized by BISF, technical colleges or management organizations). Although some foremen had received more than one of these kinds of training, 29% had been promoted without any prior training in foremanship.

The kind of training received by foremen is related to several of the other variables investigated. The main factor here is the size of the company to which a foreman is appointed. The relationship between size of firm and kind of training is described in Table 10. The smaller firms, unable to provide company training, send proportionately greater numbers of their potential foremen on external courses. The larger firms rely mainly on internal training schemes and provide some form of training for a higher proportion of their potential foremen. These differences are statistically significant ($p < 0.001$).

Size of Firm	Type of training received				N
	None	External	Company	3 months as trainee	
Less than 1,000	41%	13%	3%	54%	68
1,000-5,000	32%	2%	21%	51%	101
5,001-8,000	31%	9%	25%	51%	120
More than 8,000	21%	5%	55%	36%	164
N	131	32	145	208	453

TABLE 10: THE RELATIONSHIP BETWEEN TRAINING PRIOR TO APPOINTMENT AND THE SIZE OF THE FIRM IN WHICH SUPERVISORS ARE APPOINTED. THE PERCENTAGE VALUES IN THE TABLE SUM TO MORE THAN 100 SINCE SOME FOREMEN HAVE RECEIVED MORE THAN ONE KIND OF TRAINING

A number of differences are related to the kind of department to which a supervisor is appointed. Trainee foremen are less common (30% of appointments) in rolling mills than elsewhere (50% of appointments), but rolling mill foremen are more frequently (45% of appointments) given company training than are foremen appointed to other departments, (28% of appointments). There is an interesting tendency ($p < 0.01$) for the foremen with more qualifications or with better education to be sent more frequently on *external* courses. These variations are not due to age differences, since age is found not to be related to type of training received. It is possible that companies regard their better qualified employees as more likely to gain from this kind of course.

Concluding Remarks

It is clear that persons being promoted to supervisory positions in this sector of industry differ in a number of ways which are systematically related to other measurable variables. Despite the comparatively restricted range of technological environments sampled, the population of newly appointed foremen is fairly heterogeneous. It is important to compare this sample with others from different industries.

Company size and type of department are clearly very important variables. People being promoted to supervisory positions in smaller firms differ in a number of ways from those appointed elsewhere. A similar variation between kinds of department is present. These facts have important practical implications. One interesting question is whether different categories of firms place different emphasis on educational background and qualifications, or whether all firms prefer the same background and qualifications but some cannot obtain the "preferred" foremen.

Most of the variables with which we have been concerned are relatively easily measurable. This was necessitated by the design of the investigation which depended on information provided by companies. Newly appointed foremen are likely also to vary systematically in their attitudes and behaviour as well as in these more easily observed characteristics. We are currently investigating this possibility by means of interviews with, and attitude measurements from a representative sample of this population of 453 newly appointed first line foremen. We hope to relate any observed differences in attitudes and behaviour to variations in a series of other factors. The findings of this study will be presented in a later paper.

ACKNOWLEDGEMENTS

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Food, Drinks and Sweets in the Reduction of Industrial Fatigue

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INTRODUCTION: FATIGUE, EFFICIENCY AND SUFFERING

ONE of the oldest and best established findings of industrial psychology is represented in so-called 'fatigue curves', graphs showing how production is distributed over the working day (Floyd & Welford, 1953). The common feature that has led to their being named fatigue curves is that very significant declines in production cannot be explained in terms of technical factors and are accompanied by feelings amongst the workers of increasing physical exhaustion, boredom, lassitude, weariness, restlessness, etc. The declines, with minor variations, have been found to occur in all types of work, including the perceptual monitoring (Mackworth, 1950) or mental calculations characteristic of the work required of, for example, aeroplane pilots, and characteristic of much work in partially automated industries.

Fatigue is thus a central problem of our work life. On the one hand it more or less seriously lowers the efficiency with which technical facilities are used. On the other, the psychological states associated with fatigue are generally speaking unpleasant. Not unnaturally men will anticipate their onset and take steps to avoid them or at least delay their onset. To the direct effects of fatigue we must add the effects that arise from anticipation of fatigue.

These latter can be significant. In comparing 8 hour and 10 hour shifts in a steel mill it was found that men anticipated the 'longer haul' of the ten hour shift by warming up more slowly (Ray, 1961). Davis (1958) found in his study of heavy manual work that the decline in production was in part due to the men taking frequent small private rest pauses. Jerison (1960) found with monitoring tasks that when men expected to have only half-hour vigils there was not the usual immediate decrement (showing that the decrement was not a simple physiological impairment). The crucial role of motivation was shown in experiments (described by Baldamus, 1961, pp. 58-59) when the onset of satiation was delayed or enhanced according to whether the subjects thought the experiment was important or meaningless. Thus we see that increased effort may be required to carry out the same work either by physical impairment or from psychological causes. Fatigue decrements in output occur when the increased effort required to maintain the same level of output is not exerted.

Baldamus has argued strongly from available evidence that other forms of restrictive practice are basically concerned with balancing the expected suffering from fatigue with wages, rather than balancing production with wages. There is every reason to believe that fatigue contributes also to the indirect costs of damage and wastage and to the additional suffering of industrial accidents. In their Annual Report for 1958-59 the Medical Research Council stated that fatigue has been shown, in the laboratory, to produce human errors of a type apparently similar to those which cause accidents and industrial wastage. Confirmatory evidence has been found in the study of locomotive drivers (Babadzhanian & Kostina, 1960) and transport accidents (Davis, 1958). Maier (1946) presents accident data by time of day based on all industries in three regions from three different countries as an example of the extent to which similar patterns may be found.

THE CAUSES OF FATIGUE

Investigators have found it difficult to agree upon the exact nature of fatigue or upon its causes. Early investigators such as Vernon (1920) were struck by the long hours of arduous labour demanded in World War I factories, sometimes with little protection from the weather or the machinery. In these conditions fatigue was assumed to be primarily due to physical impairment — a drop in the free energy available to the body and an accumulation of waste materials lowering the efficiency of the muscles. By the 1930s investigators such as Wyatt & Langdon (1937) were discovering similar fatigue phenomena in the light repetitive work so characteristic of mechanized assembly work. Since the early 40s the focus of study has shifted to the partially automated industries. Although the work here is largely perceptual monitoring or mental calculation, similar production or efficiency curves emerged with similar evidence of subjective fatigue. It could no longer be assumed that fatigue is simply a linear function of energy expended in work. Fatigue was known to arise also from such other diverse conditions as noise, heat, vibration, unchanging stimulation, certain rhythms of stimulation and conflicting attitudes to a task. These factors can act separately or jointly to produce the phenomena known as fatigue. Fatigue itself came to be seen as a diverse set of unpleasant subjective states, closely tied to each other but not, perhaps, best described by the name of the one which first attracted attention, i.e., physical fatigue. The various causal factors all seem to operate through their efforts on the central nervous system, rather than on local muscles or sense organs, and the effective end-states all seem to be aspects of stress, or as we prefer to call it, *distress*. (The term 'stress' is often used in this way but we feel that it is better retained in its original usage by Selye to refer to the physiological costs of any of the affects, e.g., fear and anger as well as distress.) "There is direct neurophysiological evidence that rate of sensory inflow is one of the many factors determining the level of activity in the reticular system" (Brebner & Szafran, 1961).

The existence of levels of stimulation that are non-optimal for human beings is well established. Tomkins (1963, volume 1, page 255) has gone a step further to demonstrate that a general continuing level of non-optimal neural stimulation will elicit the affect of distress. It is the quantity not the quality of stimulation that appears to be critical, hence any one of the diverse conditions we have so far mentioned may singly or in combination act to elicit the negative feelings of distress. Like any other affect, distress alerts and mobilizes the person about conditions which, if continued, might become serious. Thus individuals automatically tend to become pre-occupied and unhappy about their hunger, thirst, physical discomforts, muscular strain, and frustrations before these have actually become serious. Their feelings also seem to be out of proportion to the current conditions. Literally they become upset; not, however, over some one small thing but over a continued run of small stresses.

STRATEGIES FOR MINIMISING FATIGUE/DISTRESS

From the above brief survey it is possible to identify several general strategies that suggest practical ways of minimizing fatigue or distress.

A. Reducing those factors that lead to fatigue, i.e., that create a continuing non-optimal level of stimulation.

Within this general strategy one can identify both those that break the continuity, or allow the individual to break it when he feels that he needs it, and those that lessen the stimulation. Both possibilities exist for external sources of stimulation, which may require heightening of motivation, improved physical fitness or a diet and dietary routine more adequate to the task.

B. Raising the tolerance for fatigue (the level at which distress will be elicited).

There are natural processes of adaptation, inurement or acclimatization that correspond to this strategy. However, the deliberate pursuit of this strategy is usually limited to drugs and, except in military settings, to the common drugs found in such things as tea, coffee, cola drinks, aspirin, tobacco.

C. Masking fatigue/distress by some other interesting activity.

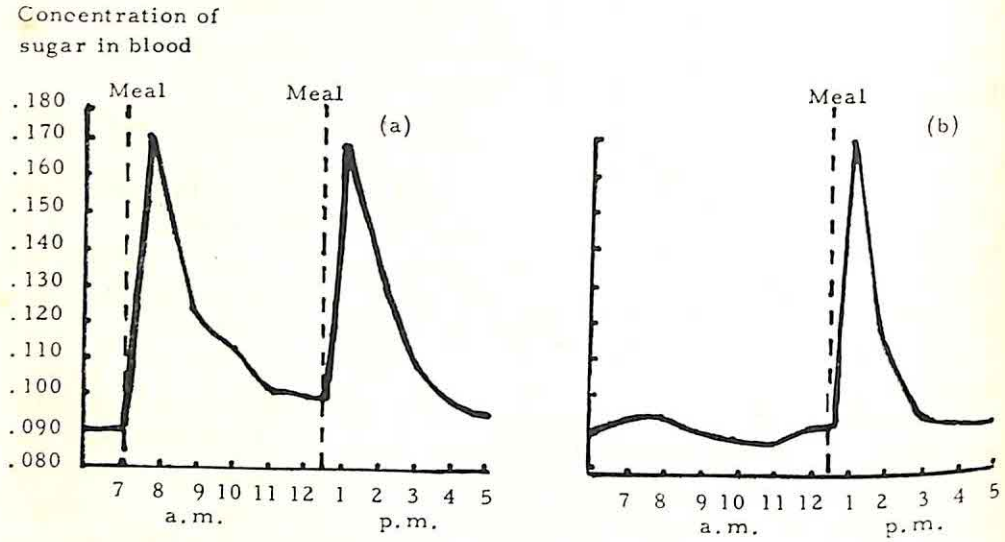
Chewing, listening to music, and day-dreaming all act in this fashion.

Our concern here is with food, drink and sweets so we will not consider further such ways of relieving fatigue/distress as involve the ergonomics of equipment design and physical work conditions or the re-organization and re-design of jobs. This is not to imply anything about the relative importance of the various approaches. Food, drink and sweets can contribute to each of the three general strategies. We will briefly indicate how.

FOOD, DRINK AND SWEETS IN REDUCING THE LEVEL OF NON-OPTIMAL STIMULATION

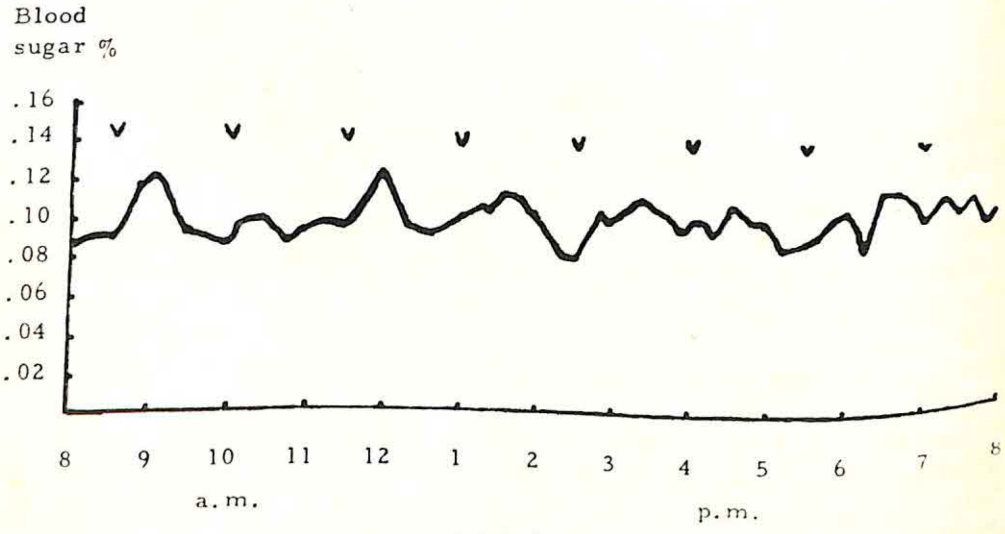
Adequate food and drink, at appropriate intervals, can prevent the bodily states of low energy and low temperature which are conducive to feelings of fatigue/distress. Blood sugar level may be taken as an index of the energy readily available to a person (provided there is no abnormality in the glucose level of the venous blood, as in diabetic patients). This is known to vary according to the timing of meals and according to the nutritional content of meals. It is also subject to independent diurnal variations. Finally, different types of work demand different amounts of energy which has to be provided by the metabolism of foods. The appropriate dietary pattern may not be that which is socially established.

The kind of relation that exists between meal patterns and the blood sugar level is well illustrated by Graph 1 below. In both (a) and (b) the blood sugar level reaches a peak about one hour after the meal (although this would vary with the content of the meal) and declines thereafter. The relevant feature for our purposes is that the subjects who went without breakfast were in the low energy state throughout the morning and to that extent more likely to suffer distress and more likely, if distressed for other reasons, to be cross and angry into the bargain.



GRAPH 1
Variations in blood sugar level according to different numbers of meals: (a) two meals, 9 people; (b) omitting breakfast, 3 people. (Haggard & Greenberg, 1935)

Tuttle and Herbert (1960) studied this same problem in an industrial setting. By studying ten men and ten women for two years they found that more work was done when an adequate breakfast was eaten than when it was omitted. If breakfast was omitted a mid-morning break and snack brought the production levels of half the workers up towards their normal. Using a continuous measure of performance Lauer and Suhr (1959) were also able to demonstrate that driving skill was kept at a higher level by allowing a rest pause with refreshments.

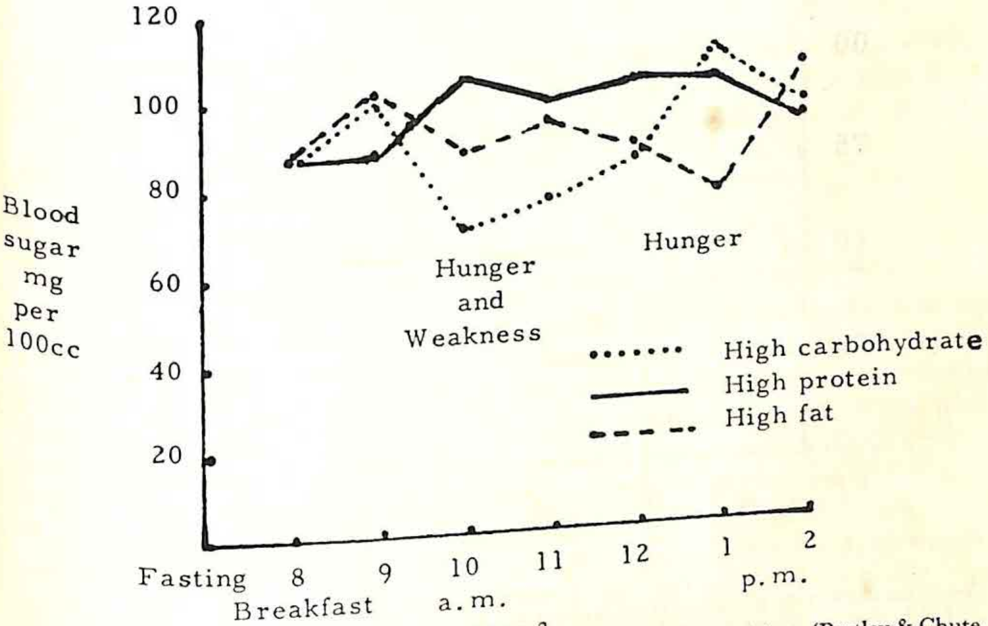


GRAPH 2
Blood sugar variations in a healthy subject taking equal meals at intervals of 1½ hours (indicated by arrows) throughout the day. (Möllerström & Sollberger, 1962)

At the other extreme from the meal pattern in Graph 1 we have that presented in Graph 2. Here the low energy states are avoided altogether by small meals at frequent intervals.

If we are to minimise the contribution to fatigue/distress that comes from this source it looks as though industrial eating habits should move more toward the pattern shown in Graph 2 while still taking some cognizance of the socially established meal pattern.

This, however, is not all of the picture. The proportions of carbohydrate, fat and protein taken in a meal affect both the changes in the blood sugar level and in the metabolic rate. Both high carbohydrate and high fat content raise the blood sugar level immediately after the meal, but while this is followed by a sharp drop with carbohydrates, reaching its lowest point within 3 hours, the high fat meal does not fall to its lowest point for 5 hours. A high protein meal, on the other hand, produces a much slower rise and a slow fall. These are illustrated in Graph 3. A similar pattern is shown by changes in the metabolic rate following the different types of food. This means that a low energy state and hunger are postponed longest by a high protein meal and least by a carbohydrate meal. As Graph 3 shows, a carbohydrate breakfast would produce an immediate noticeable improvement or alleviation of the low energy state, but even if the person did not work he would be likely to experience hunger within two hours.



GRAPH 3
Changes in blood sugar following various iso-caloric meals in a resting subject. (Bartley & Chute, 1947)

THE BRITISH DIETARY PATTERN AND ITS IMPLICATIONS FOR FATIGUE

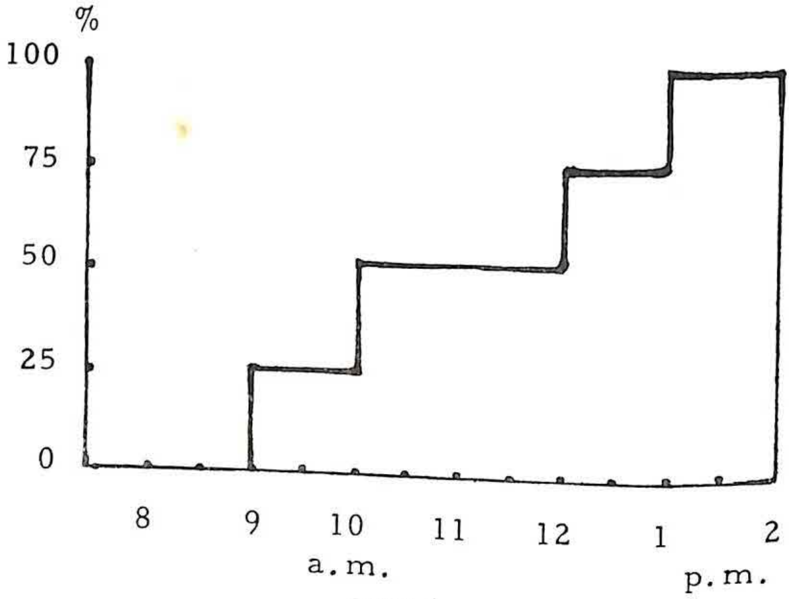
The proportion of people eating breakfast on a working day is very high, but the proportion having a cooked breakfast, which would suggest a relatively high protein content, is not only lower but shows a class bias. The figures below show that in the 'lower' social class (defined as 'manual workers') only half the men have a cooked breakfast. The time at which breakfast is eaten also varies by class, with about half the manual workers eating before 7.30 a.m.

TABLE 1:

BREAKFAST, MEN, WINTER, MONDAY TO FRIDAY (WARREN, 1958)

	Upper %	Middle %	Lower %
Having any breakfast...	97	97	95
Having cooked breakfast	67	64	54
Breakfast before 7.30 a.m.	25	35	49
Breakfast at or after 7.30 a.m. ...	72	62	56

This means that a substantial proportion of people will have a low blood-sugar level as early as 9.30 a.m. On the basis of these figures and the effective duration of carbohydrate *versus* protein meals, the proportions of manual workers experiencing hunger at different times of the morning would be expected to be something of the order shown in Graph 4, if no food was taken after breakfast:



GRAPH 4
Conservative estimate of the proportion of manual workers experiencing hunger over the morning if breakfast were the only meal taken. (Based on table 1, above)

In practice quite a high proportion of people have a mid-morning snack of some sort. Table 2 shows the contents of this meal. In this case there is not much difference between the proportions having an 'elevenses' of some sort in different classes, but it is interesting to note that the highest proportion of men who have food of some sort at this time is in the section whose work is likely to demand a heavier output of energy.

TABLE 2:

MID-MORNING SNACK, MEN, WINTER, MONDAY TO FRIDAY (WARREN, 1958)

	Upper %	Middle %	Lower %
Have mid-morning snack … …	63	64	58
Have food at this time … … …	26	28	37
Food taken:			
Biscuits … … … …	14	12	9
Cake … … … … …	7	7	9
Sandwiches or bread & butter …	5	7	17
Drinks taken:			
Tea … … … … …	35	39	43
Coffee … … … … …	20	19	10
Milk … … … … …	1	3	1
Beer … … … … …	1	1	1
Other … … … … …	5	2	2
No drink … … … …	1	1	1

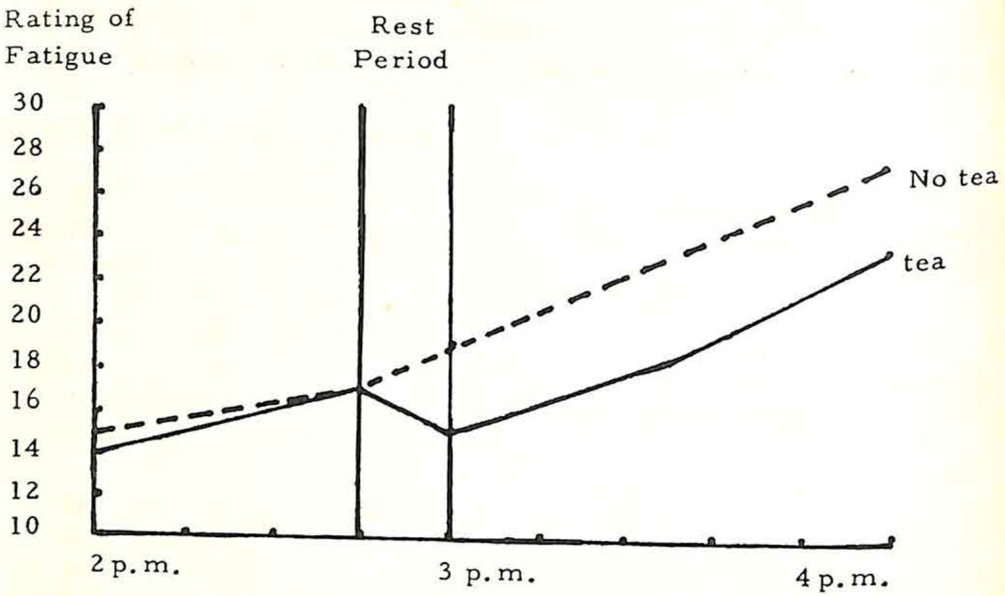
Although the manual workers make more use of their opportunities to have some food, only 17 per cent eat anything that could be expected to make much difference to the situation portrayed in Graph 4. What they have would not be likely to stave off hunger till lunch-time.

THE ROLE OF FOOD, DRINKS AND SWEETS IN RAISING THE THRESHOLD TO FEELINGS OF FATIGUE/DISTRESS

The main contributors to this strategy are the drinks containing caffeine and theo-bromine (tea, coffee, cocoa, cola drinks; chocolate to some degree). As shown in Table 2 tea and coffee are the most popular items of consumption during the morning break (and the same holds where there is an afternoon break). There is no doubt that these drinks make some contribution to the first strategy — tea by reducing thirst and coffee for its food value — but if that is all there was to it the consumption of non-caffeinated drinks would be higher.

Caffeine in ordinary dosages of 1 to 2 cups of tea or coffee has been experimentally demonstrated to allay fatigue/distress. Barmack (1940) worked his experimental subjects long enough at simple mental calculations for them to show the characteristic fatigue curve and also the symptoms of subjective fatigue/distress. Under these circumstances caffeine relieved the unpleasant feelings and improved the level of work. Both he and Nash (1962) found that caffeine had no noticeable effect on feelings or work level when subjects were fresh and interested.

Graph 5 clearly shows the kind of effects produced by having tea in work break.



GRAPH 5
Mean self rating of fatigue on 5-point scale (50=Maximum) at different periods with and without one cup of tea at rest. (Stanley & Schlosberg, 1953)

The measures of subjective fatigue needed in this study were necessarily crude, but precise measures of both simple and complex reaction time showed very significant improvement after a cup of tea as against continued slowing down without tea. By these criteria the caffeine had successfully blocked off the intrusive affects of fatigue/distress and heightened alertness to the task in hand.

Several more complex effects have been reported. Barmack found that without caffeine his experimental subjects were day-dreaming for 10-20 per cent of their working time. With caffeine they did not. As escaping into day-dreams is one way of masking distress (and a common way in some jobs; see Jahoda, 1941), this result implies the absence of fatigue/distress.

As distress is one of the prime instigators of anger, it is not surprising that caffeine has been shown to have some effects on this. Using a complex battery of personality tests, Nash showed that caffeine reduced the readiness of a person to react to frustration with anger (i.e., showed increased impunitiveness), increased the willingness to accept that events might turn out unfavourable for oneself and increased control over impulsiveness. (Using the related but more potent amphetamine sulphate, Lanzetta (1956) and Laties (1961) also found significant reduction in aggressive obstructive behaviour in work groups.) This relationship is no more than that which is summed up in the everyday words of being 'tired and cross'.

To summarise, the caffeine products, in particular tea and coffee, play a unique role in the handling of industrial fatigue. They do not reduce the sources of fatigue but they do make some contribution to delaying and lessening the anticipatory and amplifying effect of fatigue/distress. Basically they modify that polarity of behaviour and feeling that exists between alert task-orientation, and pre-occupation with one's own boredom, aches and pain. Secondarily, they may reduce willingness to take umbrage at real frustration or to imagine same.

There is a potential danger here. Drugs that dampen down the organism's natural anticipatory defences naturally increase the possibility of real damage occurring. With stronger drugs of the same class (amphetamines such as benzedrine), this may be serious enough to restrict their usage to all but crisis situations.

With tea and coffee the danger is negligible. The tannin in tea is more likely to create stomach upset and nausea before the side effects of the caffeine are obvious. Drinking large quantities of coffee will often produce unsteadiness of hand, excessive relatively uncontrolled mental ideation and sleeplessness. These quantities appear to be very much greater than the normal range of consumption. (According to *The Extra Pharmacopoeia*, 1958, a therapeutic dose is 300 to 600 mg. (5 to 10 grains); doses of 1 gm. or over may produce serious symptoms.)

USE OF FOOD, DRINKS AND SWEETS TO MASK (TAKE ONE'S MIND OFF) FATIGUE/DISTRESS

Even when it is not possible to prevent the arousal of fatigue/distress it is possible to mask it with excitement or interest so that its effects are suspended, if only temporarily. This is a strategy we know well enough in, for instance, thumb-sucking or giving sweets to a crying child and in giving ourselves an hour with television, or nail or pencil biting. 'Music while you work' and day-dreaming are obvious examples of this strategy. Food, drink and sweets may contribute to this same strategy in three main ways — the activity of mastication that they involve, their flavour and their specific dynamic action.

Chewing gum is probably the clearest example of adults using masticatory activity to mask fatigue/distress. The basic mechanism in this, as in the other types of masking, is quite simple. They provide a form of self-stimulation which blocks from consciousness the feelings that would otherwise pre-occupy them. Mastication and sucking have the added advantage of masking or commanding many of the facial muscles that would be needed to give added expression, and hence intensity, to distress or anger. Apart from chewing gum there are other sweets, e.g. toffees and the sucking sweets like mints, which have a similar function, although relying more than chewing gum does on flavour sensations.

To a lesser extent the flavour of food or sweets serves a similar masking function. For this to act longer than it normally would operate with food, the use of something like toffees or mint-type sweets is usually entailed. In other words this method of masking is not usually to be found in isolation. It is used to enhance the function of mastication and generally makes some contribution as glucose or chocolate to the first or second strategy.

The third form of masking is well known as the immediate warming effect felt with certain food such as soups. This is the 'specific dynamic action' of food. The organism reacts to the ingestion of food by releasing some of its reserves before the food is actually converted to heat. This release is not available for work by the muscles but it does warm the body. For this reason we have thought it proper not to treat this effect as a contribution to the first strategy. It would seem to act largely to mask the effects of low temperature — low energy states (but could not be expected to mask distress if this arose from heat stress).

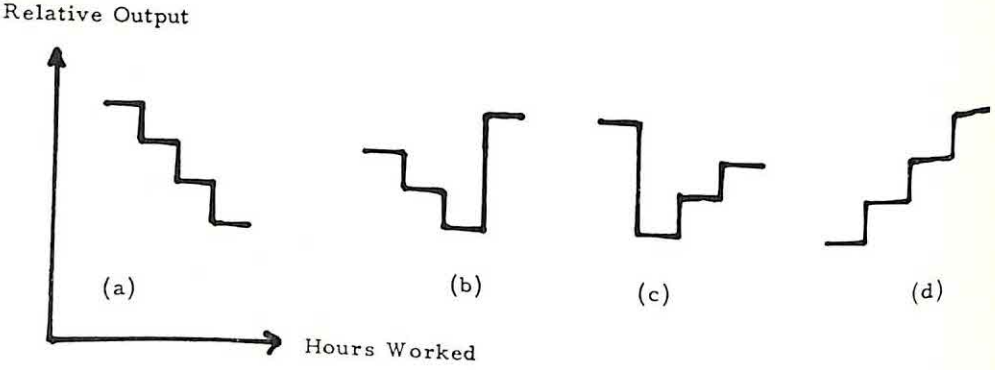
The specific dynamic action differs with the constituents of the food. There is some uncertainty about the relative value of carbohydrates and fat, but little about the fact that the specific dynamic action of proteins is related to both as approximately 7:5. Drinks such as beef tea could be expected to have this masking effect to a noticeable degree.

Where distress is associated with heat stress from heavy work or work in high ambient temperatures, the intake of tea or fruit flavoured drinks has a masking function in addition to that of replenishing the fluid lost, in that competing stimulation is provided in the mouth and throat to counteract the symptoms of thirst.

INDIVIDUAL VARIATIONS IN FATIGUE

We have so far been concerned with what can be expected to occur with groups of persons and to that extent with the 'average individual' during 'the average day'. These averages conceal a wide range of variation. Thus the average fatigue curve conceals the variety of individual fatigue curves which is illustrated in Graph 6.

Although group averages generally show the fall-off over several hours of work, individuals may vary both in their level of performance and in its changes over time. In the records of 68 workers for which output had been recorded at quarter hour intervals, Wyatt (1937) found examples of the following curves that were consistently produced by particular individuals.



GRAPH 6
Simplified forms of output curves of individuals. (Wyatt & Langdon, 1937)

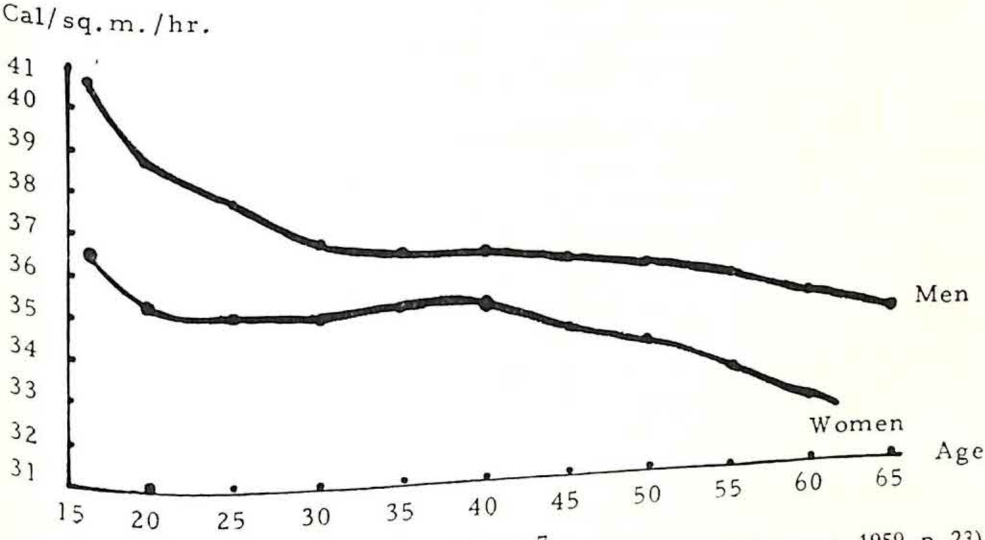
Not all of these kinds of individual curves are of equal importance. Nevertheless the observed variation is what is to be expected. There are wide and obvious differences between the ability and interest men bring to their work and their ability to tolerate or their desire to have close supervision by others. Each of these factors may in any one person contribute significantly to the development of fatigue on the job or the temporary overcoming of fatigue. Beyond this there is a wide range of variation in the physiological factors with which we are concerned in this paper. Quite apart from differences between jobs (and most productive enterprises involve a range of different jobs) even the same jobs can be expected to involve different rates of energy expenditure by different individuals, and therefore different food requirements and different daily curves for free energy. Table 3 indicates the range of energy expenditure observed for some extreme classes of work.

TABLE 3:

OBSERVED RANGE OF ENERGY EXPENDITURE ON SIMILAR ACTIVITY (DAVIDSON, MEIKLEJOHN & PASSMORE, 1959)

	Calories per minute
Sleeping	0.7 — 1.2
Office Work (N=10)	1.2 — 1.9
Coal Mining Hewing (N=18)	5.0 — 10.5
Timbering (N=18)	4.1 — 9.1
Loading (N=20)	6.0 — 8.9

The differences recorded here are quite striking. With two persons doing the same job one may be doing 50 to over 100% more than the other. These figures reflect psychological as well as physiological determinants of energy expenditure. On the physiological side we have several prime sources of individual variation. As Graph 7 shows, even under conditions of complete rest there are age and sex differences in basal metabolic rates (as measured by the energy expended by the body 12 to 18 hours after a main meal).



GRAPH 7

Fleisch's standard for basal metabolic rates (Davidson, Meiklejohn & Passmore, 1959, p. 23)

When people engage in activity the key factor is the weight they have to move. Weight makes up to three-quarters of the energy expenditure under normal conditions of tenseness. It may be expressed in the summary equations, where E stands for energy expenditure:

For men $E=815+36.6\times\text{Weight}$

For women $E=580+30.1\times\text{Weight}$

Within these systematic variations according to age and sex, Sherman (1955) cites individual variations 10 to 15% away from the average basal metabolism in normal subjects in the same age group. He also found differences of the same magnitude between measures taken on the same individual. To these systematic variations one would also need to add those that occur with seasonal changes and such periodic variations as occur with differences in diurnal variation in body temperature and the larger menstrual cycle for women. (Work reported by Van Loon (1963) as part of a larger study of high shift work supports earlier findings that these diurnal variations are pronounced, and also that full inversion does not take place in typical industrial night shift work.)

A critical fact is that although individuals maintain a good energy balance over periods of about two weeks (and an excellent balance with ±0.05 per cent over their lifetime) there is little balance within the 24 hour cycle (Durnin, 1957). On any given day, persons may be found to be at a low energy level regardless of their general level of nutrition (although the probability will vary with the systematic variations mentioned above). The reduction in peak working capacity with no breakfast can be as much as 36% according to Tuttle & Herbert (1960), who found that the average reduction in their subjects was 28%.

While the basic meal and dietary pattern may be well adjusted to nutritional requirements over time periods of about two weeks, it is clear that

(a) daily variations for an individual are not necessarily within the limits which would prevent the occurrence of low temperature, low energy states during extended periods of activity, and

(b) within any reasonably sized work force a wide variation is to be expected on any one day in the probability of occurrence of bodily states of low temperature, low energy.

These indications of individual differences suggest that the effectiveness of taking in appropriate foods, drinks or sweets will be greatly increased if the means are available for each worker to organize his own schedule. The effectiveness of self-regulation when adequate provision is made for meeting the specific requirements is shown by a study of water intake under heat stress. Here extreme values of heart rate measure and body temperature returned to normal and net fluid loss was reduced by providing water ad lib at an acceptable temperature, 42 to 45° F instead of 70°F. (Brouha, 1960).

CONCLUSION

In addition to the three main meals which give a reasonable nutritional standard in the British cultural framework, workers are likely to perform better if they have facilities for getting drinks, such as tea or coffee, and snacks or sweets in-between-times at those intervals when they *as individuals* need this 'lift'. That is to say, so far as refreshments are concerned, it can benefit production if each worker is able to regenerate energies in accordance with the requirements of his or her particular 'fatigue curve.'

ACKNOWLEDGEMENTS

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The Union Branch in the Steel Industry: A Socio-Psychological Interpretation

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STUDIES by Purcell[1], Rosen[2] and Tannenbaum[3] have demonstrated the diversity of economic and psychological benefits which the individual member derives from belonging to a union. In view of the suggestions made by these authors it would seem worth examining further the range of benefits available and this would, of course, involve a different level of analysis from the more usual one of general trade movements or union structure and wage-bargaining. Of the three writers mentioned, Purcell has perhaps been the most outspoken, claiming from his attitude survey that "for the majority of workers, the union is primarily a social and psychological instrument and secondarily, an economic wage-instrument".[4] Providing the research techniques were appropriate, an analysis of union activities over the long term might reveal indications to support Purcell's statement.

We have made a tentative exploration of these possibilities and in the following pages will present some findings which emerged from the research exercise, which was really an exercise in content analysis. The records of all meetings of one union branch over a twenty year period[5] were analysed by frequency incidence of twelve main types of activities. We have taken one union branch which has many of the special characteristics of the process-workers' organisation and which, for the steel industry, can be considered representative*. Table 1 shows the rank order of frequency of topics (this was confirmed by a separate word-count analysis giving a Spearman rank-order correlation of 0.97). The frequency ranking is a rather crude measure of the actual preponderance of types of union business since we have no assessment of the duration of time spent on items of business or of any bias present in recording them. But the analysis, imperfect as it is, does throw light on an area which has received relatively little attention — the relationship of the formal organisation of the union branch with the primary group in the factory. In abstracting the data which is relevant to specifying the nature of this relationship, it is necessary to leave out of consideration the other activities of the branch (e.g. wage-bargaining). This is, of course a matter of convenience and no judgment need be inferred from it in relation to the relative importance of the various branch activities. We also intend to examine only the three items of branch business which are particularly relevant to the primary group (promotions, seniority disputes and behavioural sanctions), leaving out the others for the sake of clarity.

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* For example, control over employee promotions is typical of the process-workers' union within the steel industry.

The description of the connection between branch and primary group functioning is the full extent of the statement to be made in the following pages. We will not attempt to explain why there is this connection or to claim that the branch provides "social satisfactions" for members: this kind of naive assumption is avoided. It is probable that members did derive such satisfactions from branch activities but we have no access to this order of information since there was no direct measure of union participants' verbal behaviour. In any case, social satisfactions would be difficult to measure even if we had conducted an attitude survey for this purpose. Walker and Guest[6] illustrated how these are among the most elusive responses to quantify. We therefore simply intend to present the results of classifying the events or business recorded in union minutes based on an analysis of their frequency or consistency over a long period.

TABLE 1: ITEM ANALYSIS OF BRANCH MINUTES (1937-56)

Items	Frequency Per cent
Promotions, Vacancies	30.0
Shift organisation	11.6
Appointment of Conference Delegates	10.8
Seniority Disputes	8.5
Award of Sickness Grants	7.8
Donations to Political Parties, etc.	7.2
Miscellaneous correspondence	6.9
Election of Officers	4.7
Welfare Topics	4.4
Management Negotiations	3.5
Behavioural Sanctions	3.0
Condolences or Congratulations to Members	1.6

Most frequent of all items of branch business were those dealing with the placement or promotion of individuals to job vacancies. This type of item is also a major illustration of the overlap between the branch and primary group structure. Blauner[7] describes the status system in industrial grades as a "socially integrating force" providing aspirational values to attain which workers "are motivated to perform well." Also included in the placement procedures are the transfer mechanisms operated in branch meetings — a sociometric-choice[8] arrangement which would no doubt have contributed to the social cohesiveness of the work-teams on the evidence of research investigation, as reported by Newcomb and others.[9]

Secondly, the branch meetings were used as an open forum for disputed promotions, this expression in the formal meetings of interpersonal conflict suggesting a control by the branch over the forces towards disintegration in the work-group, i.e. by removing the locus of conflict from the work-group to branch meetings where they could be resolved with assistance from union officials. The disagreements over who was next in the promotion line, which often emerged in the meetings, were in contrast to the norms of harmonious relationships which characterized the rolling-mill team with its network of interdependent tasks and operative roles. One fairly obvious interpretation would be of conflict-canalization through institutionalized media, the branch being an agency of the primary group in a functional sense.

Lastly, the degree of conformity to behavioural norms among work group members was an issue which arose in branch meetings evidently when informal sanctions were ineffective and as an ultimate measure to reduce deviance from standards of work behaviour. This was not a frequent item of business but it presents a highly interesting aspect of the use of formal union activity in relation to social group processes.

Each of the branch activities we have mentioned will be discussed more fully below, although we shall not in fact do more than refer to the mass of detail (1,500 items) which the content analysis produced. The discussion is, however, based at all points on the activities recorded in branch minute-books and confirmed in interviews with branch officials.[10]

STRUCTURE OF THE WORK GROUP

The consistency with which the union business was concerned with filling vacancies in operative grades is shown in Fig. 1.

Vacancies occurred not only through individual withdrawals but also through changes in machine working arrangements or in shift organisation. During the branch meetings the chairman or secretary would announce the vacancies available and present names of eligible members. Resolutions would then be passed and approved moves later transmitted to the supervisory or management staff by the officials. Although promotion was most often dealt with as a routine procedure by branch officials, from lists of names drawn up by the branch committee, it was also open to members on their own initiative to claim vacancies. While it often happened that members presented their claim for promotion at the meeting, the system was also flexible enough to allow members to refuse a promotional move if they preferred a job with lighter duties. In most cases the procedure carried through smoothly with the longer-service operatives in any one grade moving to vacancies in a grade above. The hierarchical structure of

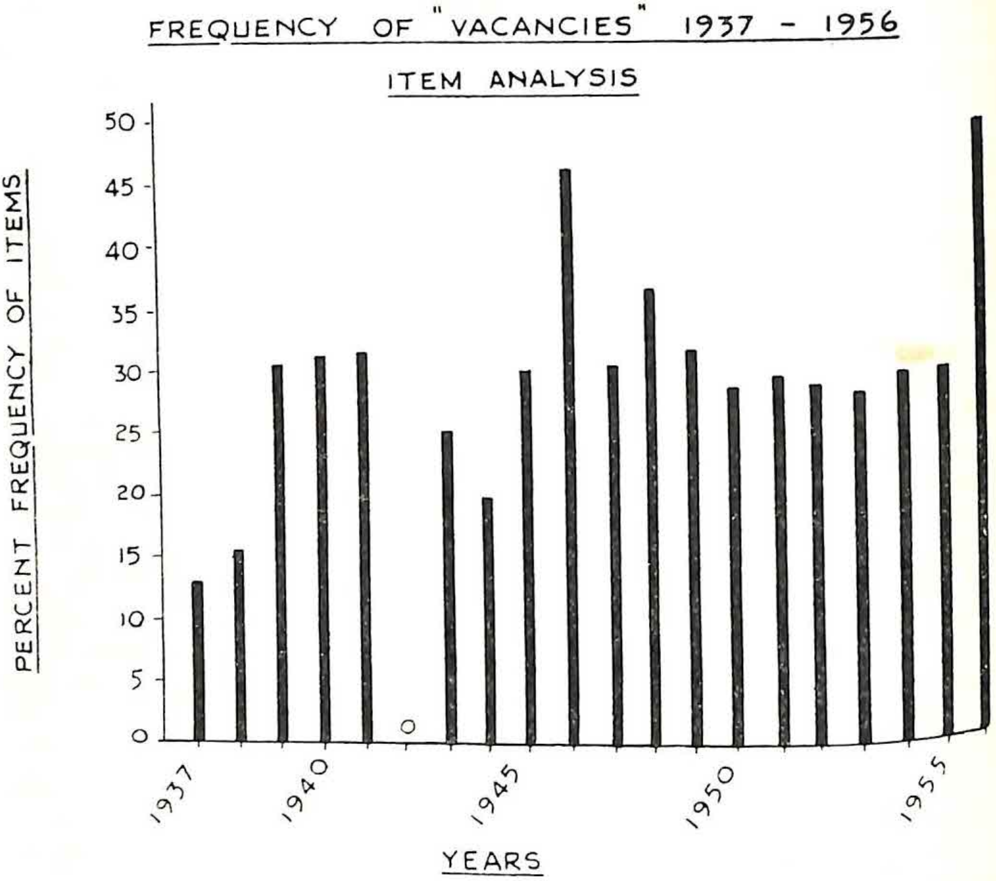

FIG. 1

work-teams consisted of a promotional ladder or line, with seven grades distinguished by title, duties, wage-level, skill and expertise.

The order of succession is represented in Table 2(a).

TABLE 2: STEEL-ROLLING CREW, PROMOTIONAL LINES

(a)	Shearer	(b)	(c)
Rollerman		Rollerman	Furnaceman
Doubler		Doubler	1st Helper
Furnaceman		1st Helper	2nd Helper
1st Helper		2nd Helper	Behinder
2nd Helper		Behinder	
Behinder or Back-roller			

The promotional line could be through each of the crew grades to rollerman as in Table 2(a). In practice the line tended to be the one shown in Table 2 (b); the second helper grade would often be missed out in the advance upwards, because of the close similarity in duties of the two bottom grades. The rollerman grade could only be reached via the grade immediately below (doubler), which was the most difficult of all in terms of muscular exertion and physical load. For this reason many operatives preferred to progress, as in Table 2 (c), only to furnaceman which although a senior position was less physically demanding. The culminating possibility in promotion was the grade of shearer, a position with large responsibilities for quality and the best paid in the factory. Translated into individual terms the promotional line provided a steady and assured progression and although its duration was often fifteen to twenty years or more it was not considered over-slow because of the very high degree of recognition and esteem which attached to the senior grades.

It seems likely that the promotional allocation was among the most attractive rewards available to a member from his attendance at branch meetings. Promotion was also a major reward available to the individual from the primary group as a reward for his attainment and conformity to group norms. The union requirement for promotion was seniority "and efficiency" and this tended to be worked out in terms of conformity to norms of work-performance or interpersonal behaviour. Consequently, there were examples in the minutes of branch members exercising a bar on the promotion of an individual by reason of his deviation from these norms.

The promotional line could operate in a downward direction for those employees who wanted to withdraw from the heavier load and responsibility of the senior grades (demotion). The second helper grade afforded the most easy "semi-retirement" position for the older operatives. This was entirely a matter of the individual's felt need and took place only on the introduction of the member's request during the meeting. Work-load strains on ageing operatives were thus modified by a procedure which was ideally suited to the individual variations in the ageing process. Mitigation of technical pressures was also possible through the existence of crews whose members were all of an older age-group, and who tended to work at below-the-mean speeds. This crew formation occurred through individually-requested transfers rather than demotions. Although there were attempts recorded in the minutes to place older men together by general resolutions of the meeting age transfers did in fact remain an individual matter.

The usual reasons for requesting a move from one crew to another are worth describing. The transfer arrangements of the branch allowed for two kinds of move. First there were moves sought for technical reasons. Preference could be expressed between machines allowing right- or left-hand working or between one kind of machine rather than another, on the basis of weight of steel bars worked. In the latter case, where an individual could choose a machine which worked heavier bars, the choice open was in terms of increased work-load as against higher levels of piece-rate wages. It would depend evidently on the internalized need-balance of the individual whether the positive valence of higher earnings outweighed the negative valence of increase in load. In the case of a move to a "Pighter" machine, there was some similarity of this type of transfer with demotion items — because the transfer might follow a changing need-balance in the individual with his increase in age and the decline in his sensori-motor efficiency.

A member might also move on the basis of friendship-choice, the transfer expressing the direction of acceptance or rejection between crew members. Thus it is interesting to see the union branch determining work-group composition by a procedure which in other settings, as a management technique, has been shown to reduce labour turnover and production costs.[11] Besides direct friendship-choice, the individual's preference was inevitably influenced by the variable rates of working which we have already mentioned as existing between crews, depending on whether most of their members were younger or older men. Attempts were made by the branch to formulate the transfer mechanism in procedural rules. In 1938 it was resolved that "the senior hand in every grade should have the privilege of changing mills . . . if dissatisfied with the crew or conditions." In 1940 the rule was discussed with the possibility of more than one move being allowed; in 1948 a resolution allowed three consecutive moves to each member. This system was extremely flexible in its operation—for example, a member whose request for a move was granted could if he wished return to his original place if the transfer did not work out as expected. Transfer deals arranged privately between members could also be formalized subsequently in the meeting: the members exchanging equivalent positions in their respective crews.

INTERPERSONAL CONFLICT

Logically, seniority disputes are closely related to promotions and vacancy items since the disputes arose from members' claims for vacancies or promotional moves. Fig. 2 shows how seniority disputes might occupy as much as 15 per cent annually of branch business.

The usual procedures for dealing with contested seniority were as follows: when more than one member claimed the same vacancy or promotional move they would be asked by the chairman to state their case to the meeting. In order to win his case the member was required to produce evidence of longer membership, but the position on membership was not always easy to establish, for example, where membership dues had lapsed during a member's absence from work, or again where members had joined the company within a few weeks or days of each other. It was usually the case, where precedence could not be established during a meeting, that the dispute would be referred to the branch committee and in the meantime branch officials would consult union records for information which could resolve the dispute.

On the face of it, the presentation of a promotional case might have been no more than a matter of informing the meeting of a set of facts. However, the members' advocacy of their claims became verbal contests where high levels of antagonism were displayed. The branch minutes refer to a "warm discussion" or a "bitter controversy" and give an indication of the antagonisms characteristic of these disputes, where each claimant in turn attempted justification of his claim with other members supporting or opposing it and union officials acting as mediators.

The expression of interpersonal conflicts on these occasions appeared to go a good way further than simply a statement of claim and counter-claim, so that the interpretation is suggested of the branch providing a safety outlet for combativeness which would have, in the mill crews, hampered the cycle of interdependent operations. Why this particular form of canalization should occur, and if the branch did not afford control what other forms could have existed, is outside our scope here. A further interpretation could be that the seniority disputes took the place of selection procedures — notions of distributive reward in the primary group being satisfied by this particular form of seeing justice done.[12] This in itself, of course, would be a positive contribution to removing a likely source of conflict in social relations. In this way the branch protected the smooth functioning of primary group relationships in work by affording a locus for the expression and containment of personal differences. Seniority disputes seem to have taken a form similar to the Scottish "flytings"—the institutionalized exchanges of verbal abuse where contestants exchanged insults and ribaldries before an audience.[13] It is interesting that during the seniority disputes, displays of interpersonal aggression could be intense; evidently the meetings were able to contain such outbursts without much difficulty and afterwards the minutes could still record that "both disputants shook hands and left the room the best of friends." By giving tension-release, meetings followed the problem-solving sequence which Bales derived from his analysis of social behaviour in small

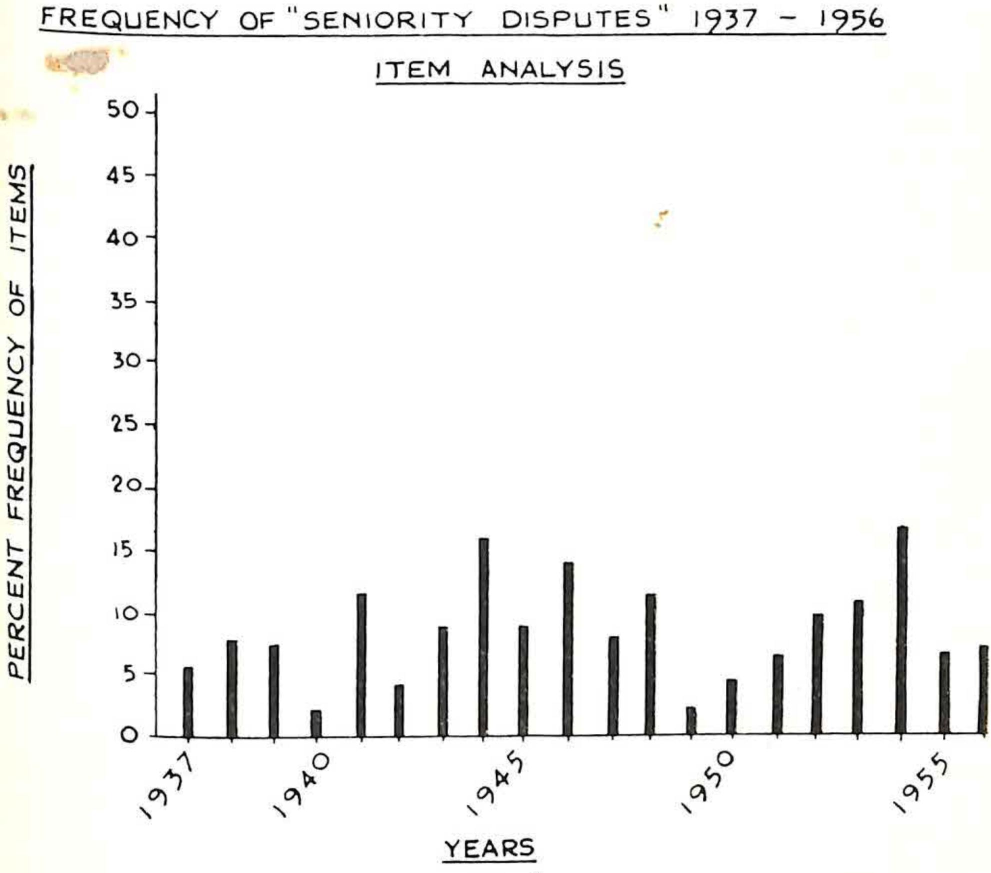

FIG. 2

groups.[14] In the section on behavioural norms it is described how the branch acted in yet more direct ways to maintain the system of interpersonal relations which existed in the rolling-mills.

BEHAVIOURAL SANCTIONS

In a sense the branch was acting as legislature for the social group in formulating procedures for promotion and transfer and as a judiciary in settling individual claims for vacancies. It performed yet another function for social organisation: implementing norms and standards of behaviour for the primary group. This was action of a relatively rare type because the implementation of group norms would most often occur in the immediate social environment, i.e. the rewards or sanctions, (for conformity or deviance), were usually administered through interpersonal communication in the work teams. However, in this case, where group members met in the branch meetings over a long period, the boundaries between formal (branch activities) and informal (social group) events became less well-defined, so that the meetings themselves became an extension of primary group interaction and a medium for social group processes.

In relation to work performance the norm was well-established of equal contribution of effort on the part of each crew member. Behavioural sanctions therefore appeared in the minutes in the form of complaints that named individuals were "not pulling their weight" or "not doing the work to the satisfaction of the rollerman". Crew members would indicate their refusal to continue working with the deviant member and ask for his displacement from the crew to be formulated in a branch resolution; the displaced member would then be transferred to the lower paid job of relief-worker. Examples of the most severe sanction—requesting a member's dismissal—is only found in the cases of extreme deviance by immigrant workers.[15] Both the introduction of workers from Eastern Europe in the late 1940s and from Italy in the 1950s produced an increase in branch actions as an enforcement agency for the primary group which Fig. 3 illustrates.

Another example of norm-enforcement arose where the branch intervened to control interpersonal relations. For efficient performance of rolling-mill operations this aspect was important because of the inter-dependence of team operations—faulty performance by any one member of a team could increase the share of work for the remainder. Moreover, control was exercised over the machine requirements through exchanges of jobs and mutual help activities which developed from, or expressed, friendship relationships between the operatives. These activities were informal in the sense that they were a matter of arrangement between individuals; by this means a greater variety was introduced, relief from the physical work-load and modification of the pressure imposed by a repetitive work-cycle. Obviously, conflicts in the team could disrupt such informal controls to the extent of making work tasks more difficult. Cases where interpersonal difficulties occurred were reported to the meeting and the members concerned could be reprimanded in formal resolutions or else transfers to other teams were arranged.

As with all norms, conformity was a matter of degree—a few crews were known to have achieved smooth relationships only partially and suffered loss of social esteem in consequence: these same crews were also rated lower by the supervisory staff in relation to both interpersonal behaviour and work performance. But with the transfer mechanisms which existed it was more than likely that most mill crews would be well-matched in their composition.

SUMMARY

A content-breakdown of the records over twenty years of one of the steel process workers' unions revealed that promotion and the filling of job vacancies took up one-third of all branch business. Promotion was allocated by seniority in branch membership but in effect each promotion depended on the individual attaining group norms for work performance and interpersonal behaviour. The branch activities in this respect could be seen to overlap with the primary group process of rewarding conforming members and this perhaps makes it difficult to separate primary group events from branch official business.

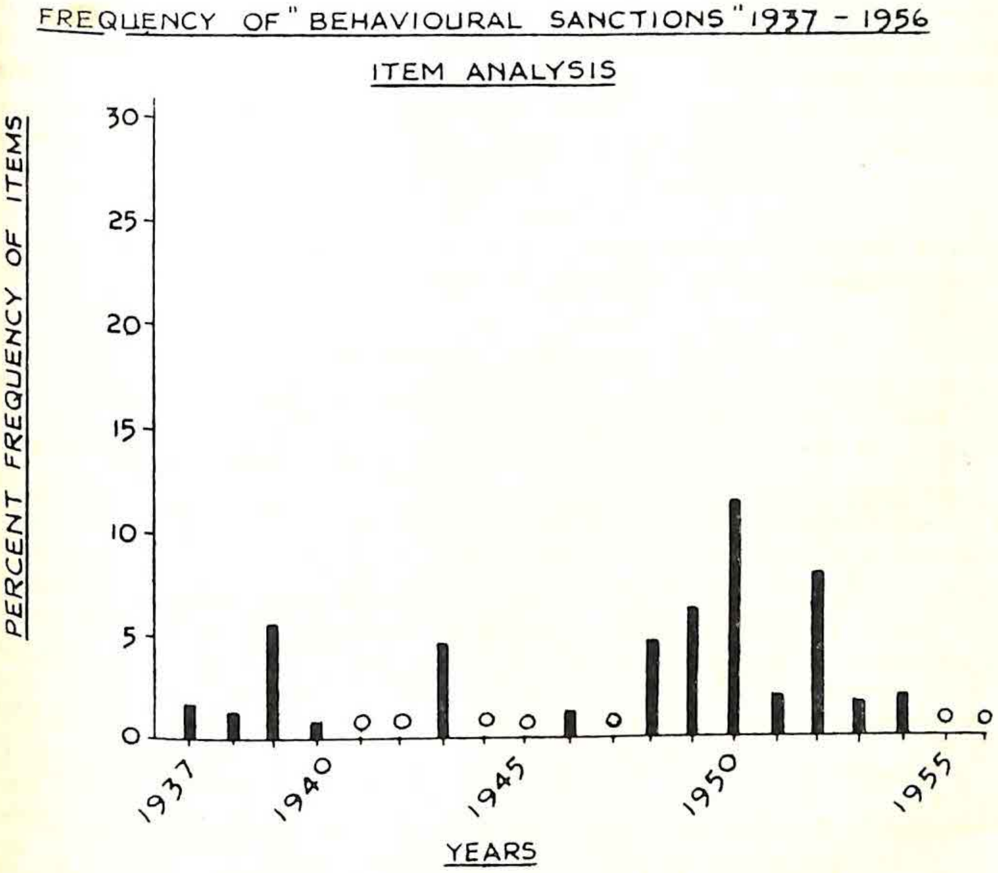

FIG. 3

The transfer mechanisms which were available to the member at meetings contributed to making the work requirements more flexible to suit individual needs and also assured a high degree of cohesion in teams whose composition depended on the members' own choice. Seniority disputes which were continually brought to the meetings, occasionally absorbing them completely, had the result of removing conflict away from the operational area of work and were functional for interpersonal relationships in this sense as well as a possible means of realising distributive justice in the status hierarchy. Lastly, enforcement of primary-group norms was in certain cases entrusted to the meetings, the formal mechanism of branch resolutions being used where informal controls in the work teams had failed.

We have seen some indications of how, through frequent types of decision taken in meetings, the union branch in a very direct way operated a measure of control over the psycho-technical environment, and maintained primary group structure through the power to allocate promotions and transfers. The main finding of our classification of branch decisions is that the branch in certain of its activities operated as an extension and agency of the primary group. Inevitably it would appear that analysis of the socio-technical system in the steel industry needs to include the union branch, because of its integral role in this system.

ACKNOWLEDGEMENT

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[3] F. Tannenbaum, "The Social Function of Trade Unionism", *Political Science Quarterly*, N.Y., Columbia University, June, 1947.

[4] Purcell, op. cit. p. 150.

[5] The period 1937-1956 was selected because during this time technology remained a constant. The technological transformation in the industry in the late 1950s has introduced alterations in branch activities which it is intended to treat in a further article.

[6] C. R. Walker and R. H. Guest, "The Man on the Assembly Line", Cambridge, Mass. Harvard University Press, 1952. p. 78.

[7] R. Blauner, "Alienation and Freedom", Chicago, University of Chicago Press, 1964. pp. 148-154.

[8] i.e. expressing the interpersonal acceptance or rejection which can be measured by sociometric tests.

[9] Theodore M. Newcomb, "Social Psychology", London, Tavistock Publications, 1952. pp. 506-509, 616-618.

[10] Interviews were held with branch officials of B.I.S.A.K.T.A. and T.G.W.U. Mr. Jim Williams, Divisional Officer, Iron & Steel Trades Confederation, examined and discussed the tabulations and results.

[11] R. H. Van Zelst, "Sociometrically Selected Worker Teams Increase Production", *Personnel Psychology*, 1952. *5*. pp. 175-186.

[12] See George C. Homans, "Social Behaviour", London, Routledge & Kegan Paul, 1961, pp. 232-264, for a discussion of the proportionality of rewards and investments in primary groups: "Fair exchange, or distributive justice in the relations among men, is realised when the profit, or reward less cost, of each man is directly proportional to his investments: such things as age, sex, seniority, or acquired skill."

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Exploring Characteristics of the Versatile Worker

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INTRODUCTION

THIS report deals with one of a series of studies of characteristics of the versatile worker. The word versatile, which is defined in the Oxford dictionary as 'turning readily from one occupation to another or capable of dealing with many subjects', has been taken as the concept which embraces those personality variables associated with effective performance in a changing work environment. The last includes matters extrinsic and intrinsic to work tasks.

On the face of it, at least two dimensions of personality, general ability and flexibility/rigidity, are likely to be of value as starting points in such an enquiry. In this study our interests are in the latter. However, as Chown (1959) proposed and later demonstrated (Chown, 1961), rigidity is a multiform concept and has many definitions. This confusion is not surprising since the subject has been the meeting point of a substantial body of research along diverse theoretical paths over six decades.

With the benefit of hindsight, we can now argue that much of the work on rigidity before World War II was misdirected. It matters little whether rigidity took the form of the German experimentalists' 'perseveration', Spearman's (1927) "p" factor or Cattell's (1935) 'dispositional rigidity', the psycho-motor and problem-solving kinds of instruments used to measure it proved to be unreliable, barely overlapped with each other and provided discouraging results (Shevach, 1937; Levitt, 1956; Luchins, 1959). The Californian studies of prejudice (Adorno *et al.*, 1950) heralded a new departure in the study of rigidity in which theories derived from psycho-analysis and social psychology played a part.

Continuing this work in the 1950s, Rokeach evolved his concept of dogmatism to take in all systems of belief rather than those of a purely political kind and he subsequently showed its importance in cognitive functioning (Rokeach, 1960). More recently, Rubenowitz (1963) has identified a flexibility/rigidity construct closely linked with the Californian F scale, Rokeach's dogmatism and other attitudinal measures of rigidity. Rubenowitz's findings indicate that this construct is independent of general ability, though the two interact, and that instruments used to measure this kind of rigidity do not correlate highly with the old psycho-motor and problem-solving tests of perseveration and dispositional rigidity.

In 1961, the writer set out on his investigations of versatile behaviour along lines indicated by the more recent work in this field. In a preliminary enquiry (Pym, 1965a) a series of questionnaires and tests, mostly dealing with occupational life, were administered to three populations of young people. The purposes of the exercise were to investigate the correlates of attitudes to change and to attempt to identify a factor resembling the flexibility/rigidity construct using the principal-component factor-analytic technique. The questionnaires and tests included: the usual range of biographical data, work aspirations (Crites, 1961), interests (Connolly, 1955) satisfactions (Likert scales based on Handyside, 1961), a job picture-frustration study (Pym, 1963), a battery of tests of ability and achievement (Cavanagh, 1960) and a 9-item Likert scale measuring attitudes to work-related change (Trumbo, 1961). Trumbo reports that, among other things, his change scale is linked positively with general ability, amount of education, freedom from anxiety and negatively with group cohesiveness.

The writer's results mostly support Trumbo's findings and on two occasions similar bipolar factors, accounting for about 10% of the variance, emerged from the factor analyses. Variables with the highest loadings on this factor are shown below.

Flexibility

favourable attitudes to work-related changes
work aspirations (freedom from control)
job interests (scientific, literary, artistic)
diversity of educational achievements (no. of subjects)
general ability

Rigidity

work aspirations (structure, financial security)
job interests (mechanical, clerical/computational)
work satisfactions
impunitiveness as a typical response to frustration

If the general hypothesis linking our concept of flexibility/rigidity to versatile behaviour holds, then we would expect the variables above to point to fluctuation in the performance of workers following changes in their work tasks.

SUBJECTS AND THEIR JOBS

The study took place in the closing room of a boot and shoe factory in north-west England. In July, 1962 there were 117 semi-skilled female operatives engaged on machining operations in the manufacture of sports wear. The average age of this population was 46.23 years, standard deviation 9.05. Each woman machined a set number of lines of work and was paid on a direct piecework basis with no limits and a guaranteed time rate. In all, the department dealt with some 27 lines of shoe in 22 sizes and the machining operations varied between 8 and 12, depending on the line of shoe. Work places were arranged in uniform lines in one large room, with each woman working independently on her own machine. 25 'indirects', made up of inspectors, labourers and feeders, assisted the machinists.

THE INNOVATION

In August, 1962 three transporters were introduced into the closing room. The transporter is a simple piece of mechanical handling equipment consisting of an automatic control panel operated by a feeder, and two conveyor belts, one carrying work from a central store to the machinists and the other bringing completed work back from the machinists. The purposes of the innovation were to centralise the supply and dispatch of materials, improve the flow of production, eliminate operator waiting time and the fetching and carrying of materials, and to facilitate more effective planning and production control. The innovation affected the jobs of the work people in the following ways:

i machinists now had to cope with all codes of work sent down the transporter rather than the limited number they had machined earlier;

ii all but three of the indirects were transferred onto productive work, including the eight inspectors;

iii machinists became responsible for their own standards of quality;

iv work places were rearranged in lines along either side of the transporter belt with up to 50 machinists working on each conveyor;

v and piece rates were increased.

From the machinists' point of view, the most important aspects of the change were an increase in the variety of machining tasks, new responsibilities for quality, and the elimination of all non-sedentary elements of the job. At the completion of the study in September, 1964, 99 of the 117 operatives remained. Nine had left the firm and the remainder had been transferred onto other work in the factory.

METHOD

All data used in this report relates to the period January 1, 1962, to September 30, 1964.

Questionnaires were administered one week before the new conditions came into operation (i.e. when the operatives were aware of the impending changes) and repeated at the conclusion of the enquiry. The predictors included Trumbo's (1961) change scale and all seven of the Crites (1961) dimensions presented in the form of 46 paired statements. Three of these, work aspirations for freedom from control, financial security and structure (regularity and order in work) were expected to be linked with fluctuations in performance following the innovation.

To these four measures above were added three others, age, number of machining tasks performed by the operative, and diversity of leisure interests. Most researches into flexibility point to a decline in this attribute with increasing age. 21 of the women were engaged in more than one kind of machining task and it was assumed that those women accustomed to variability in their work would respond most favourably to increases in this aspect. Diversity of leisure interests was measured by means of a check-list of activities shown under four main categories, intellectual, practical, active and social. The women were asked to consider each activity and indicate whether they pursued it *often*, *sometimes* or *never*. Scores were assigned 3, 1, and 0 for each item.

The criterion of behavioural response to the innovation is calculated from shifts in the performance of each operative. The mean output was derived for two ten-week periods before the innovation and four similar periods afterwards. The evidence presented in the results shows change in performance as a function of the difference between the average output during periods 1 and 2 and performance during period 6.

RESULTS

The immediate reactions of the machinists to the innovation seemed to be highly favourable. There were, however, the usual teething troubles: overloaded transporter belts, the persistence of earlier habits such as women going to collect their own work, and complaints by one or two of the inspectors about being transferred to new jobs. Some of the women drew attention to their difficulty in 'getting up speed' with the new codes. The favourable picture obtained through interviews with a cross section of the operatives at the time of the change was not reflected in their output.

Table 1A shows the mean performance of the machinists, expressed in pence/hour earnings and corrected for wage increases in the six periods. Although the shifts in average output for the group are not great, the increasing standard deviation of the group's performance over the duration of the investigation suggests that there may be considerable variability in response among the operatives. The evidence in Table 1B bears this out. We note that six months after the change, 33% of the operatives are producing less than they were before the innovation. Twenty months after the innovation, comparing periods 2 and 6, we see that marked progress has been made. Now 82% are producing more, 7% show no improvement and 11% continue to be less effective. The evidence demonstrates that the operatives reacted to the innovation in various ways. However, as anybody who has carried out research in industry knows, it is most unlikely that changes of any kind are attributable to a single isolated cause. For example, the shoe industry is plagued by trade cycles, which greatly affect production. In fact the general increase in performance, which we note in period

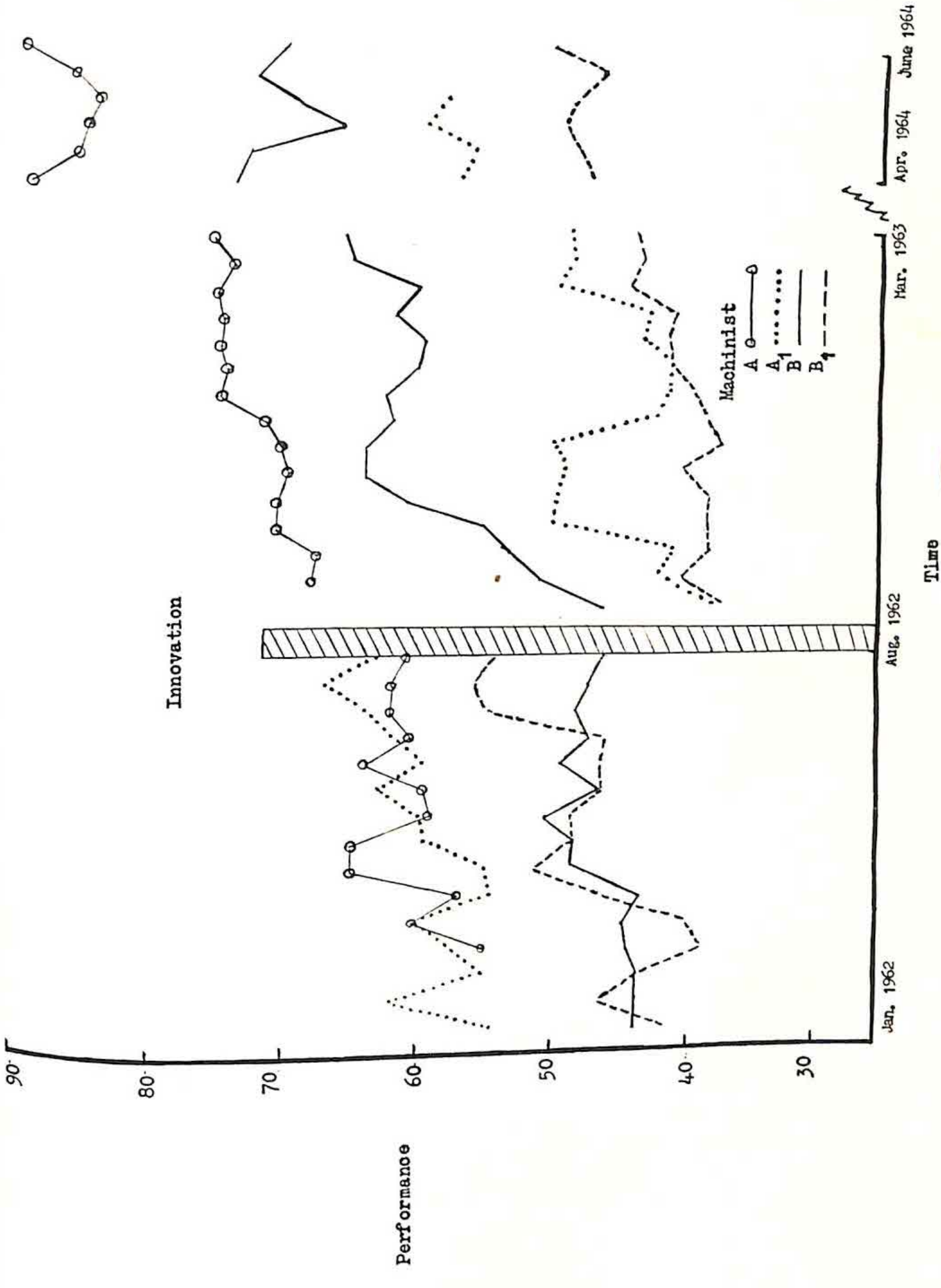
TABLE 1A: MEAN OUTPUT FOR 99 OPERATIVES IN SIX 10 WEEK PERIODS

	Period		Mean Output	S.D.
1	Jan.-Mar. 1962		45.36	9.20
2	Apr.-June 1962		48.73	9.51
		Change		
3	Aug.-Oct. 1962		44.76	10.77
4	Nov.-Dec. 1962		48.42	11.44
5	Jan.-Mar. 1963		48.62	11.76
6	Apr.-June 1964		55.27	12.42

TABLE 1B: COMPARISONS BETWEEN EQUIVALENT PERIODS OF THE PERFORMANCES OF 99 OPERATIVES

Between Periods 1 and 5 N		Between Periods 2 and 6 N
15	Output increased by > 20%	41
36	Output increased by < 20% but > 2½%	40
15	No appreciable change in output	7
33	Output decreased by > 2½%	11

Figure 1: The Performances of Four Machinists Before and After An Innovation



6, coincides with improving market conditions. But our main interests lie in the differences between operatives. The effects of the innovation on performance are demonstrated in Figure 1 where the output for two pairs of operatives (A A_1 and B B_1) is plotted. Within each pair, the women are engaged on similar tasks and are of equivalent competence before the change.

Now to the main purpose of the study. The predictive instruments, outlined earlier, are correlated with shifts in the performance of each operative, this last information being derived by subtracting the corrected mean performance for each operative in period 6 from her mean performance during periods 1 and 2. Table 2 shows that we are able to forecast how each operative would respond to the innovation; only two of the predictors fail to correlate significantly with the criterion.

TABLE 2: PREDICTORS OF RESPONSE TO CHANGE RELATED TO VARIATIONS IN THE PERFORMANCE OF 99 OPERATIVES FOLLOWING AN INNOVATION

Predictors	Scores			Product-Moment *r*s with the Criterion
	Range	Mean	S.D.	
Work Aspns. Freedom	1-14	7.25	2.09	.30**
Financial Security	1-14	8.35	2.31	—.17
Structure	1-12	8.63	1.60	—.31**
Attitudes to Change	9-45	14.69	4.40	.42**
Diversity of Leisure Interests	0-96	21.18	5.65	.33**
Age	28-64	46.23	9.05	—.21*
No. of Machining Tasks	21 of the 99 operatives had more than one task			.09

**r sig. at 1% level of confidence
*r sig. at 5% level of confidence

The relationship between the predictors varies from $r=0.28$ to -0.31, 10 of the 21 coefficients being significant beyond the 5% level. An index, based on a weighting of unity for each of the instruments, correlated 0.65 with the criterion. In a paper discussing some of these results, reported in abstract elsewhere (Pym, 1965b), this coefficient is shown as 0.71. In the earlier analysis another of the work aspirations, for skill or system, was also shown to relate to the criterion but, because the association between this variable and versatility is not yet clear, it is excluded from the results above.

DISCUSSION

This study shows that an important link can exist between the individual's attitudes, interests and aspirations and his response to changes in his environment. The findings do not rule out the relevance of mental functioning and in this respect it is unfortunate that we were unable to include a test of general ability among the predictors. The picture of the versatile operative which emerges corresponds closely with some of the newer concepts of positive mental health, in particular Maslow's (1955) distinction between growth-oriented and deficiency-oriented motivation. We note here that versatility is associated with growth-seeking tendencies (a favourable attitude to change, a broader pattern of leisure interests, a desire for autonomy) in contrast to equilibrium-oriented behaviour (a preference for regularity and order in one's working life, a dislike of unpredictable circumstances, limited and conventional interests). The desire for homeostasis also is shown to increase with age.

The relationship between age and rigidity in behaviour may derive more from cultural factors than from a deterioration in skill or cognitive functioning. Central to traditional industrial culture is the belief that there is *one best way of doing most things*. This particular notion may have grown out of an era in which machines operated on the basis of a simple one way mechanical sequence. It was certainly fashioned and shaped by the batch and mass production technologies with their emphasis on 'fragmentation' and 'regulation' as a means of increasing output and efficiency. Subsequent researches by the writer have shown that the belief in a one-best-way is a useful predictor of the individual's relative inability to cope with changes in his environment. As man has noted before, the values which develop within the narrower bounds of work can affect the whole fabric of a society. We may observe that important aspects of our educational and social processes remain imbued with the one-best-way sentiment.

These results also lead the writer to doubt the suitability of the laboratory for studying rigidity in behaviour. Measures of performance in problem-solving kinds of tasks are unlikely to tap the critical aspects of personality which bear on performance in change. In the laboratory it is difficult to simulate conditions where people have to adjust to stimuli which affect the whole complex of their habits, customs and beliefs.

The research continues.

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Choice of Career by Grammar School Boys

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INTRODUCTION

THIS inquiry was carried out at fourteen maintained boys grammar schools in the Midlands, and was part of a larger investigation* into attitudes of first year sixth-form boys towards careers and specialisation at Advanced level G.C.E. Questionnaires were answered by all the boys (583) who were starting an Advanced level course. The schools were selected at random from the counties of Buckinghamshire, Berkshire, Oxfordshire, Gloucestershire, Worcestershire, Warwickshire and Northamptonshire, according to an alphabetical list. Of the original twenty schools, fourteen agreed to take part, including large and small, and urban and rural.

The aims of the present inquiry were:

(1) to investigate the relative importance in careers guidance of school staff and parents; (2) to elucidate the principal factors in the career choices made before entry to the sixth form; and (3) to relate grammar school boys' socio-economic background to their career aims and guidance needs.

The major work of recent years on the career choices of grammar school children is that of Mrs. S. Chown (1958). Between her methods and those used in this inquiry there are two major differences. Firstly her sample was composed of an equal number of boys and girls, selected from the third form to the upper sixth, whereas this inquiry is restricted to boys who are at the transition from fifth to lower sixth. The number of children selected by Chown from the fifth form (including potential fifth form leavers) is a third of her sample, the other two thirds being selected equally from the third and fourth forms, and the upper and lower sixth forms, so that their average position in school is six to nine months behind that of the boys in this inquiry, who had just begun their first year in the sixth form. Chown rarely broke down her data by form, but always distinguished between boys and girls. Secondly, her procedure included both interview and questionnaire, whereas in this inquiry boys answered only a questionnaire. This is largely offset by the size of the present sample. Chown's sample consisted of 96 boys, whereas in this inquiry the number is 583.

Reference is also made to the study by Gustav Jahoda (1952) of job attitudes and job choices among secondary modern school leavers, based on interviews with 56 boys; and to McGuffin's study (1958) of career choices in two Belfast grammar schools, based on questionnaires. The latter includes boys of the fifth, lower sixth and upper sixth forms (254), but does not distinguish between them.

It has been assumed throughout that it is educationally beneficial for most boys in maintained grammar schools to have a clear idea of a future career that will suit them, in order that a vital sense of purpose may be given to their work. Advantages of adequate careers guidance to this end have been shown by American studies which are summarised by Yates (1959). They show that pupils receiving such guidance achieve a higher average level of attainments, the incidence of delinquency among them is lower, and a significantly higher proportion proceed to higher education. The importance of boys thinking about their careers is especially great in England with its system of sixth form specialisation.

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*The enquiry was begun by Mr. J. K. Backhouse, tutor in the Department of Education, Oxford University. The author is extremely grateful to Mr. Backhouse for his initial work and subsequent advice, to Mr. A. Yates, to Mrs. S. Chown, and to the headmasters who permitted the research to be undertaken.

ADVICE FROM ADULTS

Previous writers have shown that home and school are the major influences on choice of occupation, but they have often tended, when using statistics, to add up all the influences and draw conclusions thence as though each was equal. In the following a different procedure was adopted.

Boys were asked to indicate which of the adults listed on the questionnaire gave them help in their choices, firstly of Advanced Level G.C.E. subjects, and secondly of a career; then to underline the one who helped them most. The single adult who gave each boy major assistance is the basis of the following analyses. The inquiry's aim was to assess the relative value to each boy of the adults who advised him, and it therefore differentiates those who exercised a major influence from those whose influence was minor.

There emerged in the answers a large preponderance of influence by adults who were connected with the boys' homes. In providing valued careers guidance, relatives and friends dominated over school staff in the ratio three to one. This was naturally less true of advice about Advanced level G.C.E. subjects, although almost half of the boys relied mainly on adults at home. No preponderance of school influences has been found, furthermore, in the sixth form by the University of Oxford Department of Education study (1963). This finds equality in the influence of parents and school staff on the career choices of science sixth-formers.

TABLE 1: ADULTS GIVING 'MOST HELP' IN CHOICE OF CAREER (293)

headmaster	10	parents	138
career, house or form master	24	other relatives	7
subject master	19	friends	10
a combination of the above	11	a combination of the above	34
	64		189
youth employment officer	40		

A combination denotes either that two adults of the same group were underlined, or that adults of only one group gave any help at all and none is underlined.

The 138 mentions of parents give a percentage of 47. For Jahoda's group the percentage was 46, and for Chown's it was 24. The importance of parents' advice for these grammar school boys is therefore very similar to what it was for

Jahoda's secondary modern boys (and for Valentine and Ritchie's (1927) secondary school children), but is at variance with Chown's finding that grammar school boys are considerably less influenced by their parents than boys at secondary modern schools. The boys of Chown's sample may have consulted their parents much less because their parents were poorer and less suited to advise their bright children. An incalculable factor is the presence in Chown's sample of boys who were to leave school early.

TABLE 2: COMPARISON OF SOCIO-ECONOMIC GRADES OF ADULT 'HOME' ADVISERS

Socio-economic grade	1		2		3 to 7		TOTAL
Chown	5	*5%*	11	*11.5%*	80	*83.5%*	96
Hill	35	*12%*	62	*22 %*	192	*66 %*	289

TABLE 3: 'MOST HELP' IN CHOICE OF ADVANCED LEVEL G.C.E. SUBJECTS (455)

school staff	218
relatives and friends	192
youth employment officers ...	45

Concerning the relative importance of headmasters' and other masters' advice, this inquiry's finding accords with what Chown found, that the amount of careers guidance given by headmasters is equivalent to a quarter of the total advice given by other masters. Remarkable features in the breakdown of different masters' advice in this inquiry are the near equality of influence of subject masters and careers masters; and the fact that the careers master was only half as important an influence on boys' choices of career as the youth employment officer. These results suggest that the careers master is considerably less influential on choices of career in maintained grammar schools than one might expect.

The need for all masters to give pupils in maintained grammar schools more advice is forcefully shown by Jackson and Marsden (1962), who condemn a principle that often guides teachers, 'grammar schools work on the unrecognized assumption that the parent . . . will approach the school with specific questions when he has specific problems'. The observation of this rule was noticed by Chown. A further conclusion of this inquiry is that all masters should be well-informed about careers (and given some introduction during professional teacher training), since boys are as likely to consult them as the careers master.

Much has been written about the inadequacy of relying mainly on parents to give their children suitable careers advice (Wiegersma and Barr, 1959; Jackson and Marsden, 1962). A clear result that emerges from this enquiry is that boys who receive advice mainly from relatives and friends, tend not to have made a choice of career. 17% more of the undecided than of the decided had consulted mainly relatives and friends (significant on a χ^2 test at $p < .005$.)

TABLE 4: MAIN CAREER ADVISERS AND DECISIVENESS ABOUT A CAREER

Of those (197) who have chosen a career
81 (*41*%) received most help from school staff and Y.E.Os.
116 (*59*%) received most help from relatives and friends
Of those (96) who are undecided about a career
23 (*24*%) received most help from school staff and Y.E.Os.
73 (*76*%) received most help from relatives and friends.

Of the 583 boys questioned, 328 (that is, 56.3%) had not chosen a career. However, all were committed to courses of study which considerably restrict their future choice of a career. The high proportion of undecided supports the evidence of McGuffin's inquiry that boys in a maintained grammar school are less likely to have chosen a career than boys in a fee-paying school.

The section which follows suggests that even the careers guidance which resulted in a minority of boys obtaining a clear idea of an acceptable career, may have been less important than the proportion alone suggests, in the formation of many of the choices.

For an inquiry into the relation between intelligence and readiness to choose a career, Valentine's test for university and training college students (1954) was used. No significant correlation emerged.

BASIS OF CAREER CHOICES

Hobbies, and occupations of relatives and friends

Most important elements in the choice of career before the age of sixteen in the present sample are hobbies and acquaintance with friends' and relatives' occupations. 33.3% chose a career which was closely related to a hobby, and 41% one related to the occupation of a relative or friend, which, discounting overlap, made a total of 59.8%.

The proportion of 41% of career choices related to the occupation of a relative or friend entirely endorses Chown's finding that grammar school children are less influenced by the example of relatives and friends than secondary modern school children. That 33.3% chose a career related to a hobby indicates a substantial correlation between hobbies and career choice. It is considerably higher than Chown's proportion of grammar school children (7%) who openly claimed hobbies as overt influences, and suggests that hobbies often constitute a factor that is not consciously considered. This is suggested also by Chown's wider comparison of boys' job choices with their 'type of interests', in which 93% placed first or second on a paired comparison of five types, interests which influenced their choice of career.

The relation between a hobby and a chosen career was obtained by comparing the chosen career with the answer to the question, 'What are your hobbies?' The term hobbies was not narrowly interpreted and the answers ranged widely from holiday jobs to having girl friends.

The relation between career and relative or friend's occupation was gathered from answers to the question, 'Are any of the following engaged in the occupation you have chosen: parents, other relatives, friends?' When more than one relative or friend was engaged in the chosen occupation the overlap was subtracted.

TABLE 5: INFLUENCE OF HOBBIES, AND OF RELATIVES' AND FRIENDS' OCCUPATIONS ON CAREER CHOICES

255 boys (out of the 583) had chosen a career
of these 85 (33.3%) had chosen careers related to a hobby
104 (41%) had chosen a career related to the occupation of a relative or friend
37 (14.5%) had chosen a career with both these characteristics

With the boys in this group should be grouped the large number who were influenced by a strong sense of vocation (table 6). All these would have tended in some respects to benefit less than others from the careers guidance they received.

Stated reasons for choices

The boys were also asked on the questionnaire to state what influenced them to choose a particular occupation or, if they were undecided, what they were looking for in a career. After the reading of a sample of the answers it was found profitable to look for three fairly distinct groups of motives, one or two of which might be more important for each individual boy. The following were the groups selected:

(1) interest or ability in a particular school subject or outside activity, in general vocational;

(2) conditions of work such as travel, open air, use of hands, 'meet people', 'be of use', in general applying to a wide variety of jobs;

(3) rewards, including salary and promotion prospects, pension and holidays, in general 'what may be got out' of a job.

For about half the boys it was found that one of these factors completely dominated the other two. Their answers are analysed in the following table.

TABLE 6: SINGLE FACTORS INFLUENCING CHOICE OF CAREER

	vocational (169)		conditions of work (78)		rewards(47)		indeterminate	TOTAL
decided	150	*89%*	26	*33.3%*	12	*25.6%*	67	255
undecided	19	*11%*	52	*66.7%*	35	*77.4%*	222	328

Taking the figures for the boys who did not give indeterminate answers, and considering the vocational factors on the one hand and using conditions and rewards on the other, we have $\chi^2=1360$, $p<.001$.

Of boys seeking an outlet for a particular interest or ability, a career had been chosen by 89%, while of those who were most interested in working conditions, 33.3% had chosen a career, and of those who considered most important salary, promotion, pension and holiday prospects only 25.6% had chosen. Particularly significant (at $p < .001$) is the contrast between the vocational and the other two groups. A similar pattern, though less marked, emerged in the analysis of the answers of the remaining boys who were influenced by more than one factor.

It was concluded that motives relating to personal abilities and interests are very important in the career choices of pre-sixth formers, and that those who choose after entering the sixth form may take for granted interests and aptitudes, and allow greater emphasis to differences of working conditions and rewards. This difference in motives of boys before and after entry to the sixth form reflects Ginzberg's finding that the main reasons for choice of occupation before the age of fifteen are interests, influence and capacities. An important question arises from this whether early choice of specialised, Advanced level subjects is seriously harmful to vocational choice. If most of those who choose a career after entry to the sixth form, are weakly motivated by concern for their interests and aptitudes, little may be lost with regard to these if their scope for choice is restricted by specialisation. On the contrary appetite grows by what it feeds upon, and distinctive interests are likely to be developed by specialised courses, particularly if they are chosen, as usually they are, with reference to a boy's subject preferences.

EFFECT OF SOCIO-ECONOMIC BACKGROUND

Reasons for choice

Boys were classified by their father's occupation according to the seven grade scale used in Glass (1954), except that grades five, six and seven (skilled and routine non-manual, semi-skilled, unskilled) were combined to form a more reliable sample.

Boys in the two upper grades (professional and higher administrative; managerial and executive) tended to give less attention in their choice of career to differences of salary, pension, holidays and promotion prospects. The difference is marked between these two grades and the others. There is a similar tendency for boys in the upper grades to give more consideration to conditions of work. Both these factors are balanced by the distribution of the third, by the considerably greater interest of boys from poorer homes in differences of salary, pension, etc. (signficant on a χ^2 test, 1 DF at $p < .025$). This increases continually through the middle and lower grades.

These patterns reflect a well-known tendency of boys from lower socio-economic groups to leave school at the ages of fifteen and sixteen, and they demonstrate how the urge to earn good money, holidays, etc., also has greater relative influence on the boys from these classes who continue into the sixth form. This is likely to result in their being rather more inclined than others to enter immediately on leaving school into a lucrative job, instead of pursuing full-time, higher education.

In these 289 cases only was it possible to relate home background to vocational factors, conditions of work, and rewards.

TABLE 7: HOME BACKGROUND AND SINGLE FACTORS INFLUENCING CHOICE OF CAREER

Socio-economic grade	1	%	2	%	3	%	4	%	5 to 7	%
total	35	*100*	62	*100*	61	*100*	60	*100*	71	*100*
vocational	24	*68.5*	39	*63*	35	*57.4*	37	*61.7*	41	*57.8*
conditions of work ...	11	*31.5*	16	*26*	15	*24.6*	12	*20*	16	*22.5*
rewards	—	—	7	*11*	11	*18*	11	*18.3*	14	*19.7*

Specialisation

The question was considered of a possible relation between home background and the subjects chosen for sixth form specialisation. No correlation however was found between socio-economic background and choice of Arts or Science.

TABLE 8: HOME BACKGROUND AND CHOICE OF ARTS OR SCIENCE

Socio-economic grade	1	2	3	4	5	6
Arts and Science specialists ...	56	100	105	82	76	26
Arts exceed Science	0	—4	7	—5	4	0

In 445 cases it was possible to relate home background and choice of Arts or Science.

Advisers

Interest in occupations' material rewards might alone suggest that boys from poorer backgrounds have special need of guidance about what is offered by careers. There was also good evidence that such boys either give greater weight to, or make more effort to seek out, the assistance of institutional advisers (school staff and youth employment officers), in the choice of a career and of Advanced level subjects. The following analyses reveal a significant contrast between the two upper grades and the others. In the upper grades boys were less receptive to the advice of institutional advisers than to that of relatives and friends, while the reverse is true of boys in the lower grades (significant on χ^2 tests at $p < .05$ for help about careers and at $p < .002$ for help about Advanced levels).

That boys from poorer backgrounds seek and have more need of careers guidance from school staff must be contrasted with the contemporary tendency for careers masters to be more lowly regarded and of less importance in maintained grammar schools than in independent schools (Lewis, 1964).

TABLE 9: HOME BACKGROUND AND ADULTS WHO GAVE MOST HELP ABOUT CAREERS

Socio-economic grade	1	%	2	%	3	%	4	%	5	%
total …	37	*100*	64	*100*	59	*100*	62	*100*	56	*100*
home advisers …	27	*73*	51	*80*	37	*63*	32	*51.5*	34	*61*
institutional advisers …	10	*27*	13	*20*	22	*37*	30	*48.5*	22	*39*
home advisers exceed institutional … …	17	*46*	38	*60*	15	*26*	2	*3*	12	*22*

In these 278 cases only was it possible to relate home background and adults who gave most help about careers.

TABLE 10: HOME BACKGROUND AND ADULTS WHO GAVE MOST HELP ABOUT ADVANCED LEVELS

Socio-economic grade	1	%	2	%	3	%	4	%	5	%
total …	56	*100*	102	*100*	101	*100*	84	*100*	75	*100*
home advisers …	28	*50*	58	*57*	37	*37*	28	*33*	30	*40*
institutional advisers …	28	*50*	44	*43*	64	*63*	56	*67*	45	*60*
home advisers exceed institutional …	0	*0*	14	*14*	–27	*–26*	–28	*–34*	–15	*–20*

In these 318 cases only was it possible to relate home background and adults who gave most help about Advanced levels.

CONCLUSION

Grammar school boys in this sample received less valued careers guidance than might be expected from the staff of schools. This is suggested by the boys' indication that masters were only a third as helpful as relatives and friends, and is supported by the fact that, of the boys who had chosen a career, (a) 59.8% chose one related closely to a hobby and/or the occupation of a relative or friend, and (b) 59% stated that they had been mostly influenced by a personal interest or aptitude. Both these groups contain the boys who have marginally less need of careers guidance, because they already have some notion of the career they would like.

The undecided (56.3%), on the other hand, are overwhelmingly boys who are more interested in conditions of work and material rewards. Either masters and others feel less confident in advising these boys and so give them less attention; or commitment by an adolescent to a choice of career requires, beyond details of working conditions and rewards, awareness of a particular aptitude or interest which may be involved.

These boys are also less likely to incline towards a relative's occupation after they have acquired the independence of sixth-formers, and they have passed the age when hobbies are most influential (Ginzberg *et al*, 1951). One may conclude that they will probably have greater need than others of advice in the sixth-form, and furthermore that they should always have had closer guidance.

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A Study of the Ability of Experienced and Naive Subjects to Recognise a Change in the Rate of Movement of a Lever

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SUMMARY

THE paper reports experiments on skilled drilling operators and subjects with no drilling experience to find their ability to recognise a change in the rate of descent of a drilling machine hand feed lever. The success of each group at the task was the same but the response times, pressures exerted on the lever and guessing patterns were very different. In the case of guesswork it is suggested that this is the factor which may differentiate the two groups and it may be important for the successful performance of a skilled drilling task.

INTRODUCTION

There are several industrial cases where experience has resulted in an enhanced ability to recognise sensory signals at a very low level (Henry, 1953; Brown, 1960 and Craik, 1944). Whether there is a physical improvement in the receptor channel concerned, or whether it is that normally the particular level of change is not 'noticed' (i.e., the attention of the operator has been directed onto this change and thus he consciously notices it when it occurs) is still a matter of argument. It would seem reasonable, however, that if a group of skilled operators have ability to recognise a change smaller than that normally recognised by the general population, then that change may be of use to them for control purposes in their daily work.

During studies of sensitive drilling some experiments were set up to determine the differences in the ability to recognise changes in the pressure and rate of movement of a drilling machine handle. The experiments were limited to the range of movement found when drilling a $\frac{1}{8}''$ dia. hole in metal under industrial conditions.

Subjective analysis would suggest that the pressure on, or movement of, the drill handle under the operator's hand would be highly significant as a source of control information. To separate the two and test them independently while retaining some similarity to the drilling situation has not yet been shown to be possible, although the method eventually adopted gave some measure of independence under certain circumstances.

Similar work has been conducted by Henry (1953) in relation to the performance of sportsmen. He was interested however in a static situation where he was able to test pressure at constant position, and constant pressure regardless of the position. With an apparatus of some ingenuity he determined the thresholds for constant position, and constant pressure, under conditions of varying rates of pressure application. The apparatus was in the form of a thrust pad on a joy stick in front of the subjects, who were blindfolded for the experiments. He found that a constant position against a varying load could be held with great accuracy, whereas the constant load was very much less accurately maintained. The constant position experiments gave a threshold value for the rotation of the elbow joint of about $\frac{1}{2}$°, which was equivalent to an average error of .07 lbs. As the range tested was from 14 to 28 lbs this sensitivity was unlikely to be related to a judgement of pressure. Woodworth (1899) had reported work by Goldscheider on the high sensitivity to rotation of the human joints, remarking that "the sensitivity to angular rotation of the long and short bones is such as to give comparable thresholds for different joints when accuracy is measured in units of absolute arc distance at the extremity of the limb."

The presence of an apparent ability to recognise very small joint movements leads to the suggestion that small changes in the rate of joint movement may be recognisable. Ability to recognise changes in pressure, force, or weights, appears to be coarser than the joint sensitivities suggested by the results of Henry's experiments. Chapanis, Garner & Morgan (1949, p. 317) quote results by Jenkins where a difference of 8% is suggested as that required to recognise a change in a force of 10 lbs (the order of force applied to the drill handle when drilling a $\frac{1}{8}''$ diameter hole). It would appear useful, therefore, if some values for the sensitivity to changes in movement could be obtained.

Examination of this previous work made it clear that a high degree of simulation of a drilling operation would have to be obtained if the results were to give information of use in the drilling study of which they were a part (Corlett, 1960, 1962).

The rate of application of the force or movement is a significant factor where thresholds of this nature are being determined. Henry (1953) noticed this in the results previously mentioned. Craik (1944) found that the error of a limb movement in gun setting decreased as the rotation of the limb increased up to about 2°. It is the incidence of such significant effects, due to factors other than those being studied, which made it important that an unrealistic or over-simplified situation was not used for the test.

EXPERIMENTAL METHOD

The apparatus used is shown in Fig. 1. The design was such that it could be carried into a factory and used on the work table of the drilling machine normally used by the operator. Operating the drilling machine handle applied a force to the apparatus, which was recorded. This pressure also started the rotation of the cam shaft. Five cams on the camshaft could be selected at will. Each cam had two rates of fall. The rate of fall of the first section of each cam was the same and was chosen to represent a normal feed-rate for drilling a $\frac{1}{8}''$ diameter hole in mild steel. The second section had an increased rate of fall and the cams were arranged on their shaft so that each cam had a rate of fall greater than the previous one by an equal interval. The starting position of the cams could be pre-set so that the operator could experience up to 8 seconds of the first rate of fall before a change of rate occurred. Rotation of the cam shaft was read from a graduated dial on its end, the dial being graduated in seconds (time).

In operation the cam follower was set at a selected position on a selected cam, the selection being from tables of random numbers. The operator was told to engage the mandrel with the ball race on the cam follower, the drilling machine running at normal drilling speed all the while, and to apply drilling pressure, thus starting the operation. The drilling machine handle then began to descend. As soon as he noticed a yielding of the "drill" (representing the point where the rate of descent of the drill changed, at the second part of the cam) he was to relieve the pressure, thus stopping the test apparatus. From the graduated dial the position of the cam could then be determined, and thus the time to notice the change of feed rate; whilst the pressure maintained during the operation was recorded on the paper tape. It will be noticed that the behaviour is that which is normal for an industrial drill operator. As the yield of

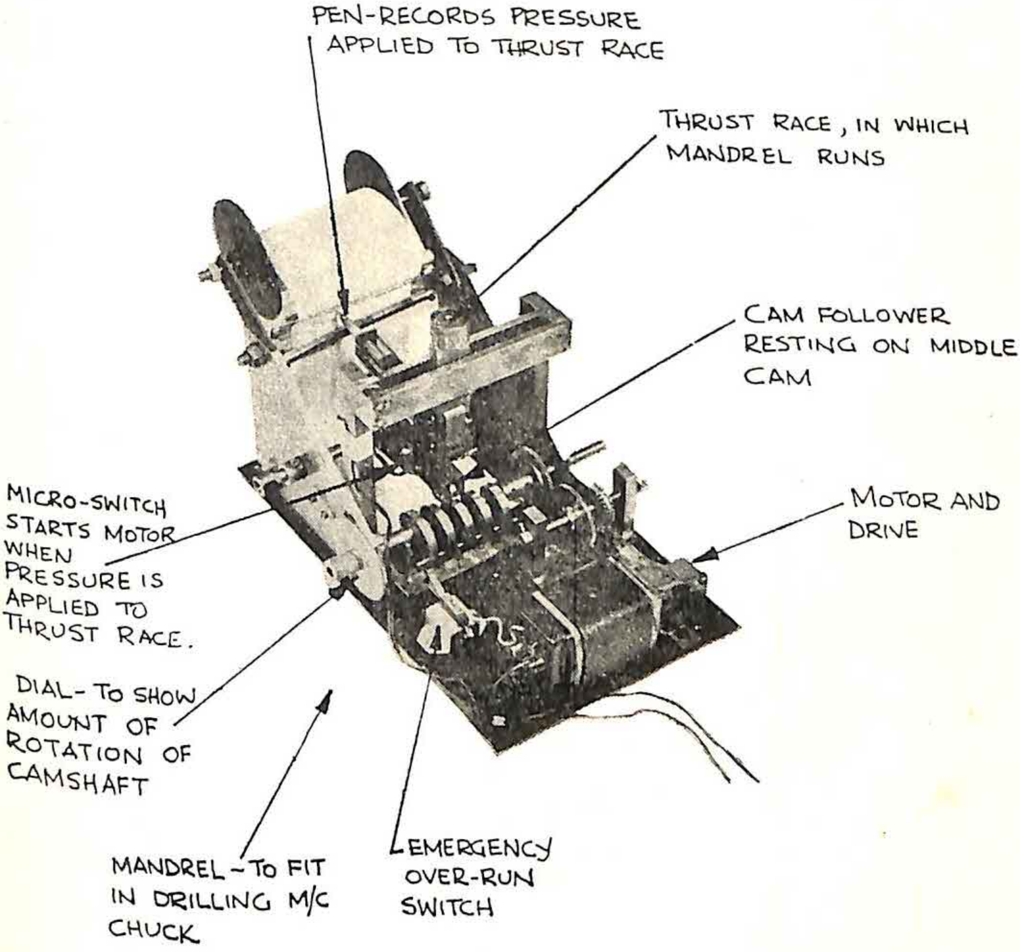
PEN-RECORDS PRESSURE APPLIED TO THRUST RACE
THRUST RACE, IN WHICH MANDREL RUNS
CAM FOLLOWER RESTING ON MIDDLE CAM
MICRO-SWITCH STARTS MOTOR WHEN PRESSURE IS APPLIED TO THRUST RACE.
MOTOR AND DRIVE
DIAL - TO SHOW AMOUNT OF ROTATION OF CAMSHAFT
MANDREL - TO FIT IN DRILLING M/C CHUCK
EMERGENCY OVER-RUN SWITCH

Fig. 1 MOVEMENT TESTING APPARATUS (COVER OMITTED)

the materials is felt, at the time of break-through of the drill, the pressure is relieved. The entire test simulates as closely as possible the normal experience of the subject.

A preliminary test was carried out with the apparatus on three unskilled and three skilled operators. The unskilled were post-graduate students of the University with no previous experience in drilling, the skilled operators had experience of 7, 8 and 12 years. A combination of 5 cams and 5 different starting points on the first section of each cam gave a 5 × 5 randomized block experiment. For this first experiment the cams used differed widely in their rates of fall. The initial fall rate was 1″ in 60 seconds and the increased fall rates were evenly spaced between 1″ in 30 seconds and 1″ in 10 seconds. The pressures at response of the two classes of operators were plotted as histograms as well as the

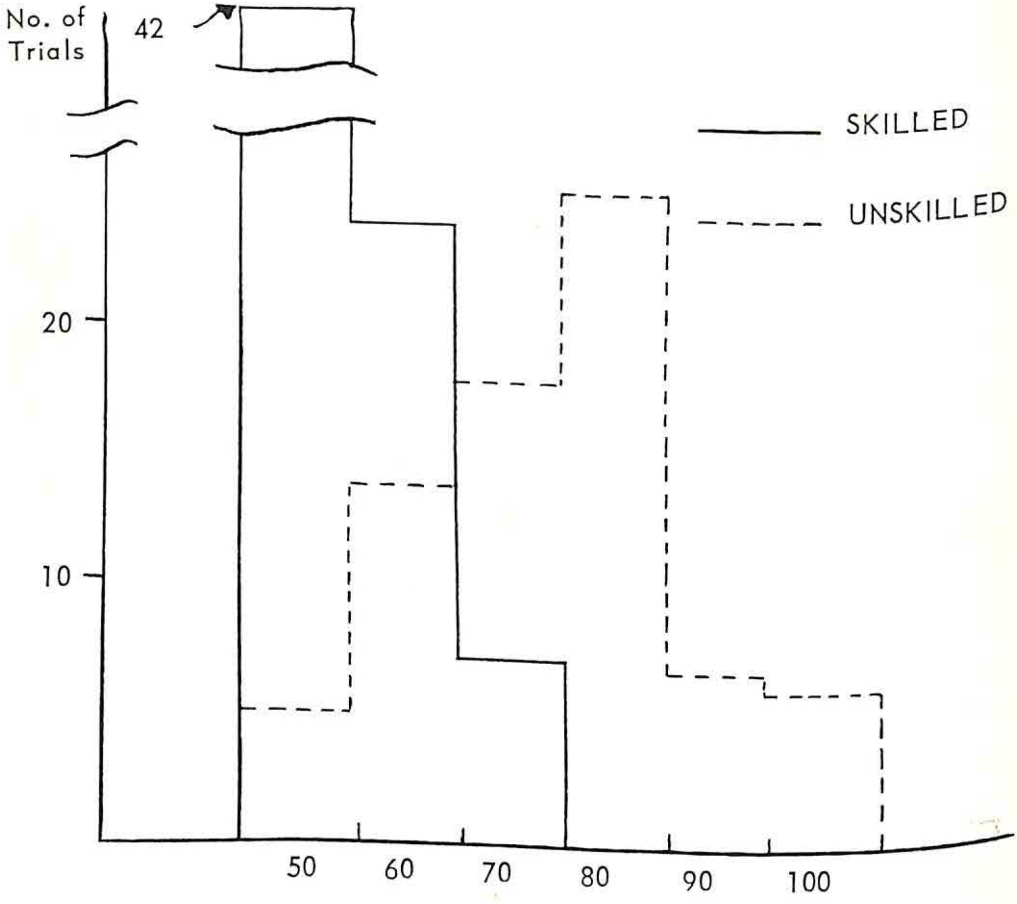

Fig.2 – RESPONSE PRESSURE (lbs)

response times for the 6 subjects. The graphs are shown as Figs. 2 and 3. Each subject had one trial at each condition, thus each histogram represents 75 trials.

It will be seen that the response of the skilled operators to the change in feed rate was, with two exceptions, always after the change had taken place, and heavily positively skewed. Nearly half of the changes were immediately recognised. Unskilled operators found much greater difficulty in noticing the change, making many responses even before a change had occurred. Pressure shows a similar difference, being much more constant for skilled than for unskilled operators.

This experiment appears to indicate that the experienced operator may indeed have a threshold substantially lower than the 'average' person. The results of Fig. 2 show that on only a few occasions did the skilled operator not notice a change in rate, seeming to indicate that the grading of the cams was too coarse. A further set of cams was therefore made which covered a narrower range of values (see Table 1) and the experiment was repeated with a larger number of operators to obtain a more accurate indication of the differences between the two groups. Fig. 4 gives a photograph showing how the modified apparatus was used in a factory. The trolley incorporates the batteries, working top and compartments for carrying the apparatus itself.

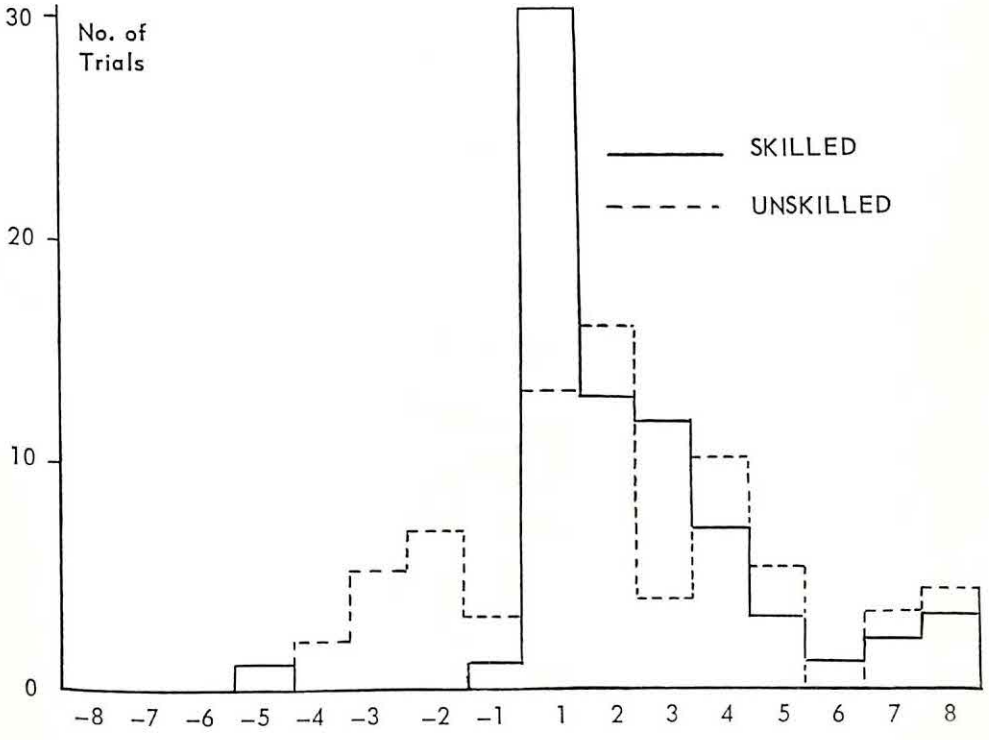

Fig.3 – RESPONSE TIMES (SECONDS)

The experiment was conducted with seven skilled operators and ten unskilled operators. All the subjects were women and the skilled operators had been engaged for several years in drilling holes smaller than $\frac{1}{8}''$ diameter in steel components.

The purpose of the experiment was described to each subject and the subjects allowed to experience a few runs on the apparatus until they had correctly recognised the change point on the coarsest cam at least three times. For each of the skilled subjects a randomised block of 25 trials (five cams × five starts) was run and for the unskilled subjects Graeco-Latin squares were used, each subject having ten trials.

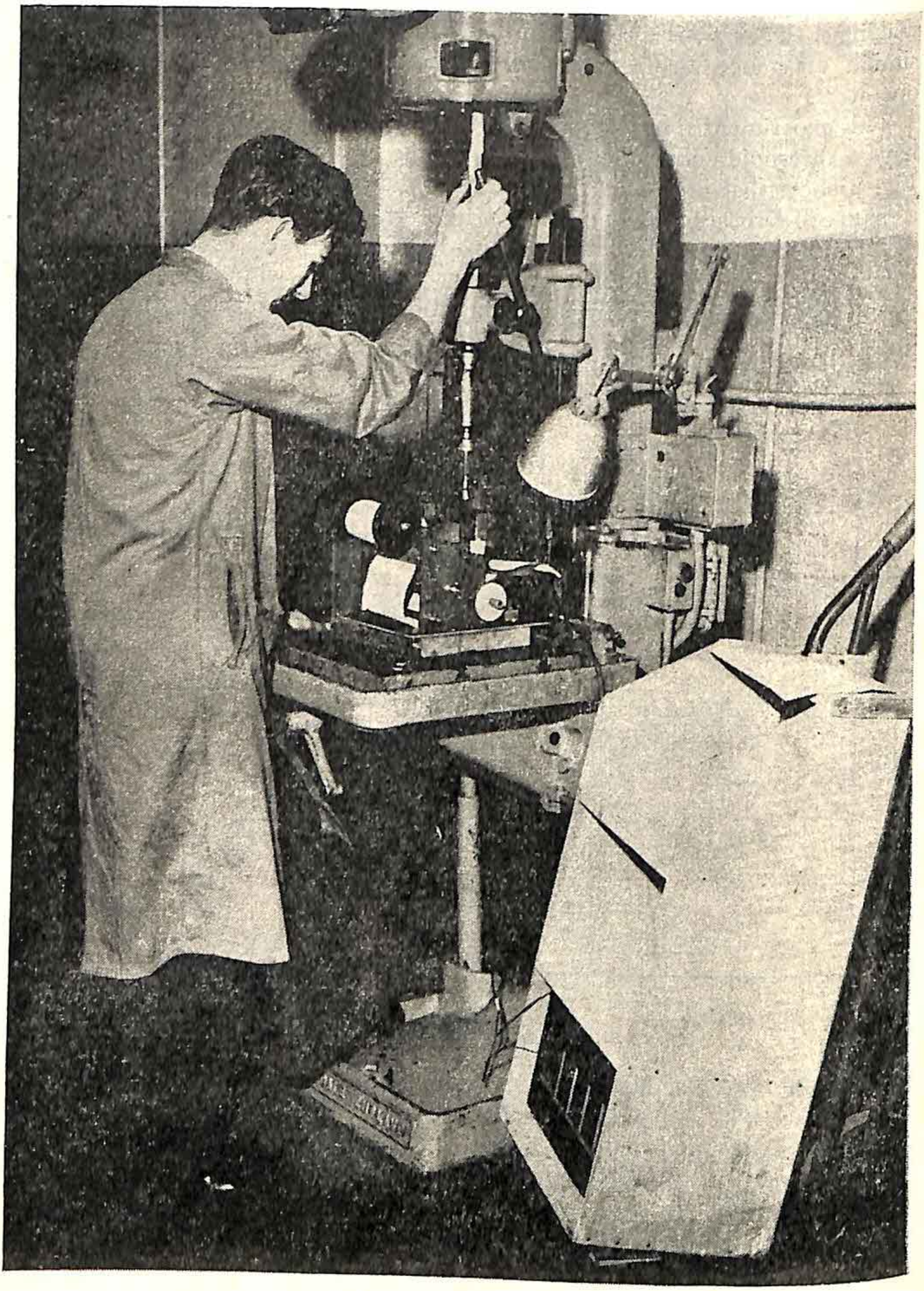

Fig. 4 THE MOVEMENT TEST APPARATUS IN USE. (PEN & CAMS HIDDEN FROM OPERATOR.)

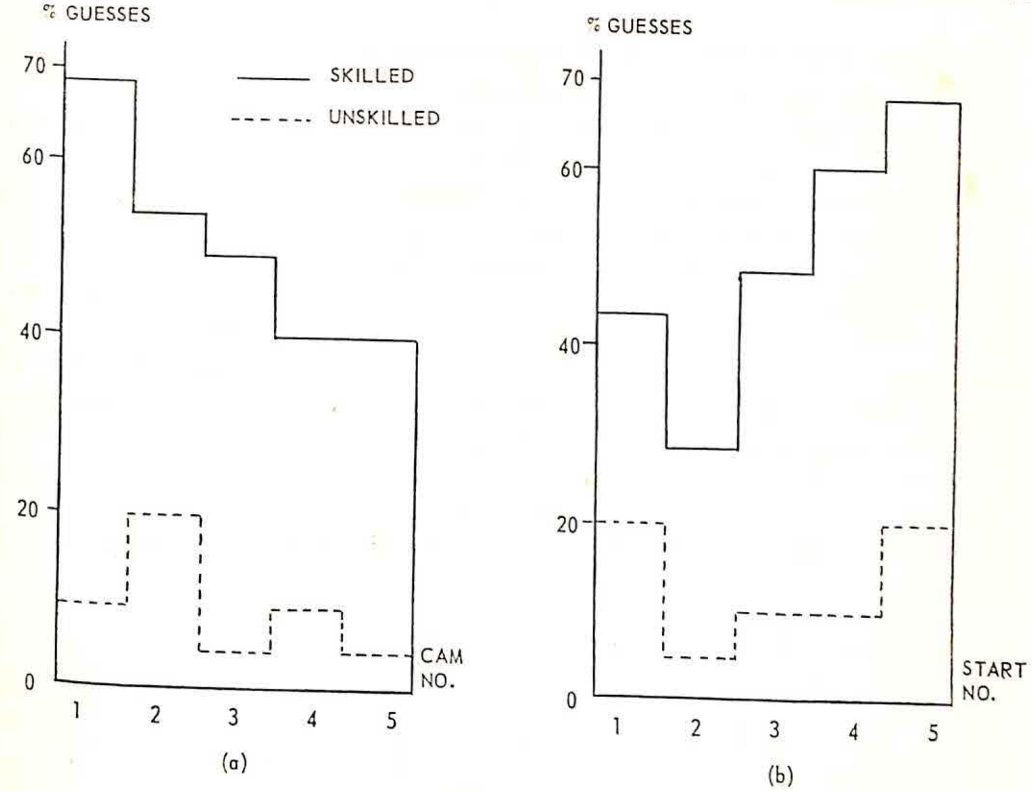

Fig.5 GUESSES RELATED TO CAMS AND STARTS

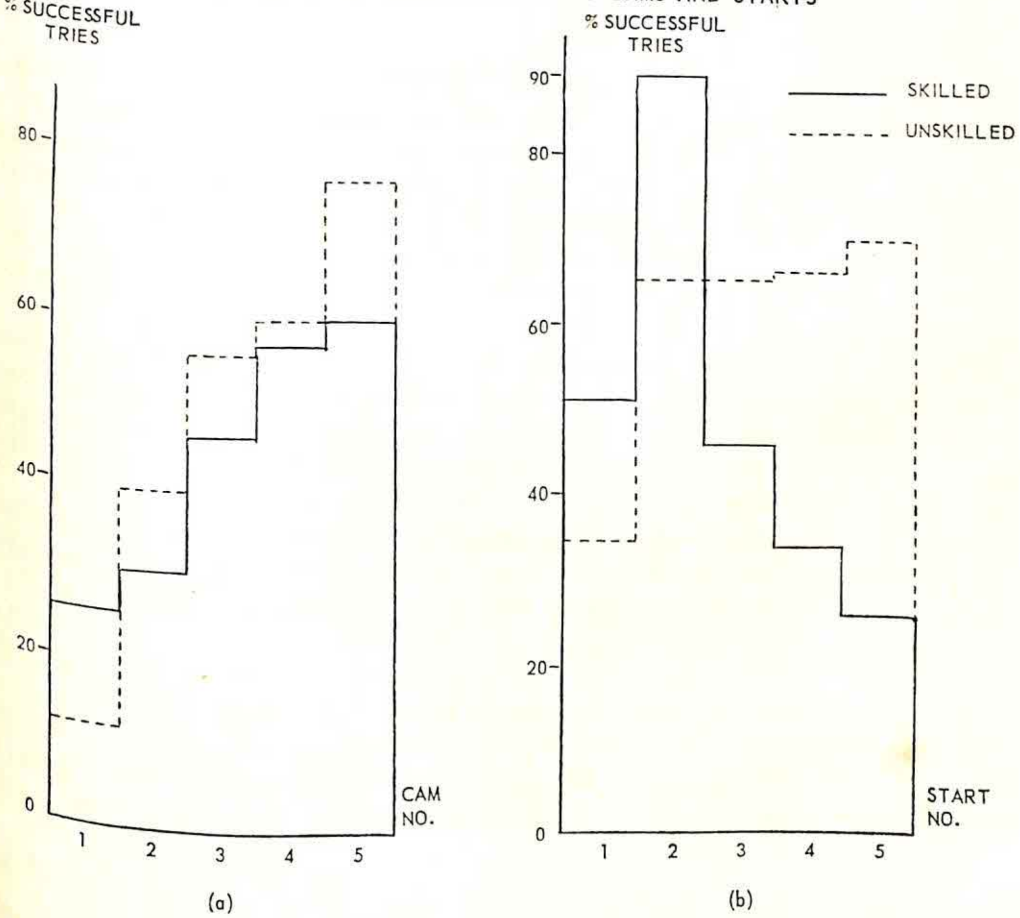

Fig.6 SUCCESSES RELATED TO CAMS AND STARTS

RESULTS AND DISCUSSION

For the analysis of these data the following decisions were made:

(i) Responses which occurred between the change point and up to 1.9 seconds after it are correct responses.

(ii) Responses occurring more than 4 seconds after the change point are considered to be complete misses.

(iii) Values in between these two times are guesses.

Table 1 shows the total number of correct responses for the skilled and unskilled subjects for each cam and each starting position. The number of the starting position is also equal to the number of seconds between the start of rotation and the point of change on the cam. The rate of fall of the cams after the change point increases from cam 1 to cam 5.

TABLE 1:

Skilled (7 trials per cell)

Start					
Cam	1	2	3	4	5
1	1	3	2	2	1
2	2	4	2	1	2
3	4	4	4	3	1
4	5	7	4	2	2
5	6	5	4	2	3

Unskilled (4 trials per cell)

Start					
Cam	1	2	3	4	5
1	0	1	1	1	0
2	1	1	2	3	3
3	0	4	3	3	4
4	2	4	3	3	3
5	4	3	4	4	4

Since the number per cell for each table is different, the numbers themselves are not directly comparable. It will be noticed, however, that although the difficulty of recognition of the first and second cams may be said to be common to the two groups of subjects, for the more obvious cams the longer start appeared to upset the skilled group but help the unskilled.

The suggestion that the longer start produces poor results for the skilled subjects leads to Fig. 5, which is a histogram of the guesses expressed as a percentage of the total number of trials and plotted against both cam number, (a), and start number, (b). The skilled group were clearly very much more prone to guess than the unskilled, and although the amount of guessing was less for the more obvious cams, it was still very high. The picture for the starts confirms the suggestion of Table 1, namely that the decrement in performance with the longer starts is due to more guessing.

It might be supposed that this is putting the skilled subjects in a very inferior position to that of the unskilled. Fig. 6 (a) and (b) show the percentage successes gained by each group plotted against the cam number (a) and start number (b). The difference in performance in relation to cam number is not strikingly different between the two groups but the more erratic distribution of the skilled results when the start number is taken as a basis is evident from (b).

In considering the relative behaviour of the two groups, Fig. 6 (a) shows that from the point of view of successfully recognising a change the available evidence is not sufficient to postulate a difference between the groups. Yet there are considerable differences in their behaviour when their results are related to the starting time or when guesses are considered.

The ten unskilled operators for this experiment were all university secretarial staff and from the point of view of having a tendency to guess, may not be a random population. Bearing in mind this possibility, that the two groups of subjects are in some respects separate groups rather than the skilled being a sub-group of the unskilled, the "pressure" results from this experiment may be examined. It will be recalled that the intention when recording the pressure was

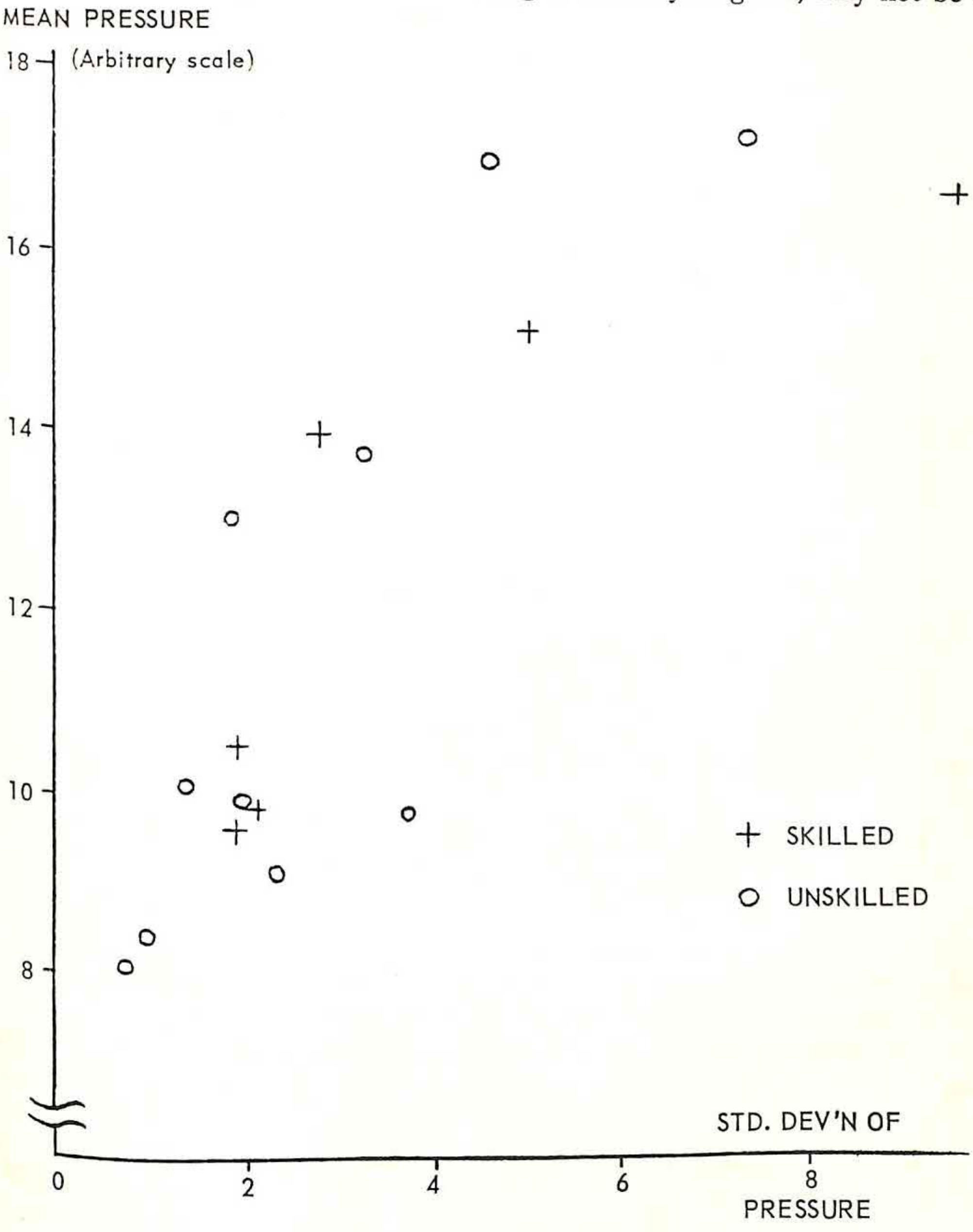

Fig.7 PRESSURE v S.D. OF PRESSURE FOR EACH SUBJECT

to attempt to separate whether the stimulus, when a change in the drill handle movement occurred, was due to the change in the rate of movement or a change in the pressure on the hand. The amount of additional pressure which is just noticeable, is proportional to the existing pressure; thus, if pressure variations were important it is reasonable to suppose that the skilled operators would have developed a control method involving maintaining a steady pressure and tending to use as low a pressure as practicable.

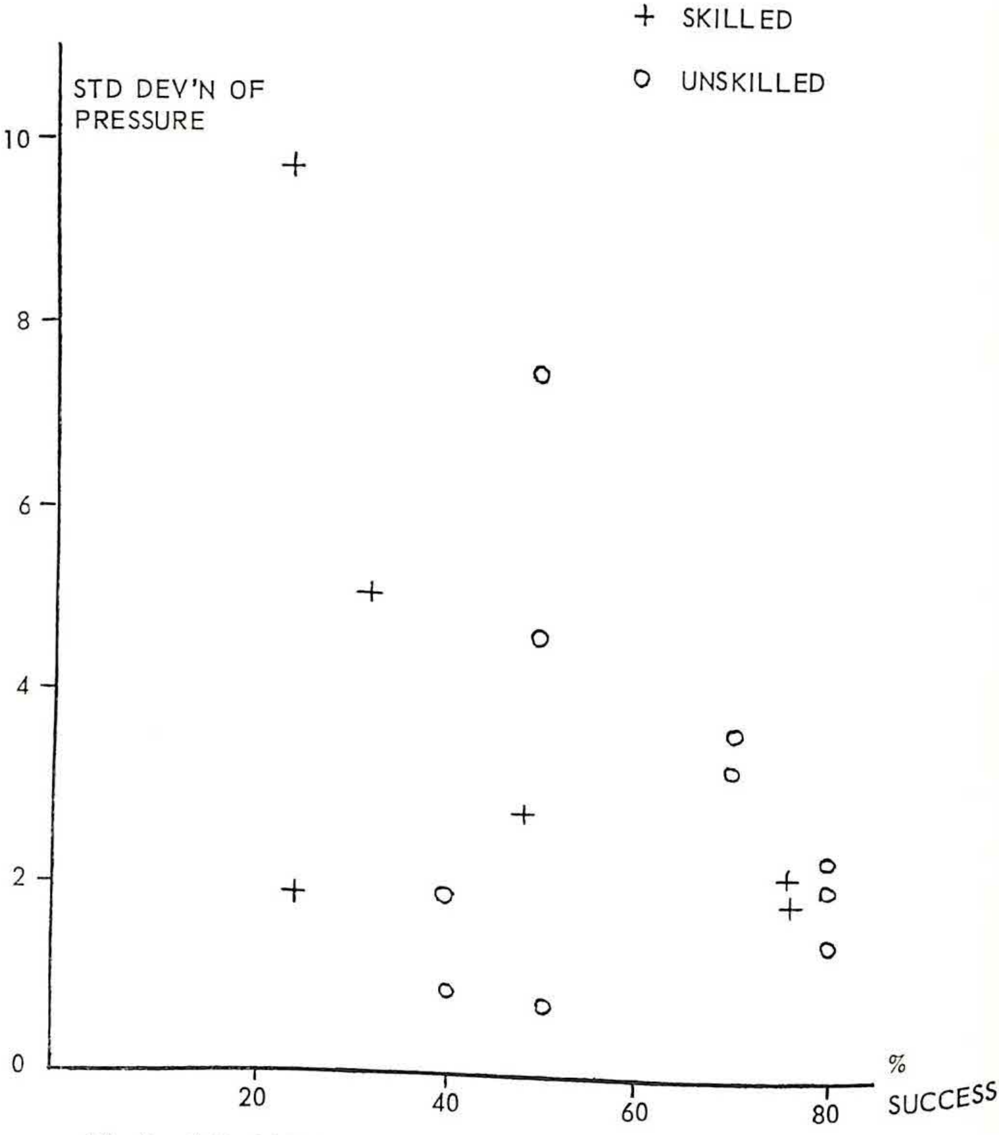

Fig.8 S.D. OF PRESSURE v SUCCESS FOR EACH SUBJECT

Results of six of the skilled operators and the ten unskilled operators are shown in Fig. 7 and Fig. 8. The mean pressure and the S.D. of the pressures exerted over each subject's tests are plotted against each other in Fig. 7, and the percentage success of each subject is compared with her standard deviation in Fig. 8.

Considering Fig. 7, there is no evidence to show that the skilled are different from the unskilled with respect to the way they have exerted pressure on the apparatus; suggesting that pressure was not an important factor to the skilled operators. Fig. 8 again does not suggest great differences between the two groups but does imply that high success cannot be expected if the subject tends to vary the pressure considerably.

Since pressure appears unlikely to be the factor which produces recognition of the change point on this apparatus it may be tentatively concluded that the change in the rate of movement is the operative stimulus. However, wide variations in pressure during the test cycle, giving rise to a high value of the standard deviation for the subject, could also hinder recognition of the change under the rate-of-movement hypothesis. As previously mentioned, the high sensitivity of the joints to rotation is a well-known fact, and varying the pressure on the drill handle may give variations in the rate of movement appreciable at these levels of sensitivity. It would seem that a more detailed examination of the relationship between the pressure and the success of each trial may be of interest, to see if a particular degree of consistency of pressure was associated with success and if pressure changes throw any light on the guessed results.

The main conclusions from this experiment may be summarised as:—

(i) The degree of success between the two groups was much the same.

(ii) The "skilled" group guessed very much more than the "unskilled" group.

(iii) Rate of movement was the most probable stimulus for recognising the change point.

(iv) A high degree of success cannot be obtained with a widely varying applied pressure, suggesting that a steady rate of movement of the drill handle is required.

(v) The big differences between the two groups with respect to the tendency to guess and the effect of the starting position suggests that the use of a "personality" test may indicate some reasons for these differences.

Finally, the use of the Graeco-Latin square design for testing the unskilled operators was unfortunate, since the presence of interactions between the treatments should have been suspected. The continuation of the randomised blocks, as was used for the skilled operators, would have been the better experimental design. It may be possible to produce a design better able to separate between correct responses and guesses, and the development of such a design, and its use on an unskilled group more random than the present unskilled group appears to have been, would be desirable as a preliminary to experiments to determine more conclusive results than those given here.

ACKNOWLEDGEMENTS

The assistance of Professor H. E. Daniels, Professor of Statistics, this University, and Messrs. A. T. Clementson and H. F. Ross, Lecturers at this University, is gratefully acknowledged.

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Book Reviews

Behaviour Theories and the Status of Psychology. By G. WESTBY. Cardiff: University of Wales Press, 1963. Pp. 32. Price 3s. 6d.

Professor Westby's review of the current standing of psychology, delivered as his inaugural lecture at Cardiff, combines wisdom, erudition and wit. Those who have not time to read Koch's seven volume study of Psychology can be recommended to read Westby's thirty-page inaugural. In smaller compass they will get an equally judicious appraisal of the status of psychology, which will inoculate them against over-confidence and dogmatism, and at the same time stimulate and interest them. No department could have been more auspiciously inaugurated.

L. S. HEARNSHAW

Spatial Ability: Its Educational and Social Significance. By I. MACFARLANE SMITH. London: University of London Press, 1964. Pp. 408. Price 35s.

Macfarlane Smith has accumulated a most impressive array of evidence to prove the importance of spatial ability.

He considers that the future prosperity of Great Britain is obstructed by failure to give adequate weight to it in selection procedures, and by failure to provide proper educational courses at advanced levels for pupils with exceptional spatial ability. A cultural tradition persists, which originated in the classical tradition of the older universities, and has been passed on by them to public and grammar schools; it places greater value on verbal abilities than technical abilities. It offers better facilities for the training of administrators, jurists, politicians and clergymen than of scientists or engineers with the specialised qualifications and expertise needed for appointments with authority and responsibility in a civilization with an already advanced and still rapidly advancing technology.

His review of the results of factor analyses, which have been rather divergent, traces connections between spatial, mechanical and practical factors, with factors of spatial relation and orientation, visualisation and kinaesthetic imagery described by American psychologists, and with factors involved in mathematics, particularly at advanced levels. He argues that in all of them aspects of spatial ability are to be found. Although it is related to the development of manual skills and to success in practical occupations, it is far more, in his opinion, than a purely practical factor. On the contrary, it plays an important part in the development of abstract thinking, and helps to promote advanced attainments in mathematics, physics, chemistry, medicine and other sciences, including psychology.

It tends to go with a reserved, self-sufficient reflective personality and with initiative and emotional stability. It has a masculine bias, and may be associated with schizoid tendencies; while verbal ability in contrast tends to go with a more extraverted and sociable type of personality. Thus it is less likely to make a good impression at an interview; and in selection procedures and in short-term follow-up studies where results are based on superiors' rating scales, its value is likely to be underestimated, in comparison with the value it proves to have in long-term studies using objective criteria.

Associations with indices of body-build and E.E.G. records are also discussed. There is no doubt that Macfarlane Smith is an eager advocate of spatial ability, a subject which he has studied for many years. He consistently maximises its importance as far as the evidence allows. But he has also a remarkably thorough knowledge of all the evidence available and does not misrepresent the opinions of authors with whom he disagrees. He has produced a very useful book. Incidentally it contains a great deal of information about spatial tests issued by the National Foundation for Educational Research and the National Institute of Industrial Psychology.

PATRICK SLATER

Training Within the Organisation. By DAVID KING. London: Tavistock, 1964. Pp. xxii+274. Price 38s.

This is the first thoroughly commendable and practical book on operator and supervisory training to be published in the United Kingdom. It will be welcomed by a large public of production and personnel managers and of potential instructors and training officers as well as by consultants and psychologists in industry.

Part I describes the particular experience of three separate companies in introducing training, and analyses its apparent failure in one of them after initial success. This practical experience provides a basis for the discussion of some fundamental questions in training which constitutes Part II and illustrates Parts III and IV which deal with designing company policy for operator training and the procedures needed for establishing it.

Three important contributions may be singled out from amongst many. First, the whole work rests on an appreciation that processes of training can do no more than assist processes of learning; the success of training will depend as much on perceptive analysis of what must be learned and of what is difficult to learn as on provision of exercises, graded practice, and control of other conditions in which learning is to be attempted. Practical guidance is given on how to make such analyses and on when to seek help in doing so.

A rationale is given for the immediate provision of information about the success of training trials and implications in terms of the need for production records and their use are made plain.

Another underlying theme of great significance is the proper integration of training objectives and activities with the specified needs of production departments. Training can succeed only if it submits realistically to this constraint in its design; but on the other hand production departments themselves have obligations to determine training requirements, to review achievements of training efforts, and to ensure the fair reception of newcomers on which depend improvements in production quality, quantity and morale that training can undoubtedly bring.

The author succeeds in conveying the logic of essential procedures in terms that are concrete but which permit generalising and which will assist in practical applications.

ISABEL BLAIN

How to Study. By HARRY MADDOX. London: Pan Books, 1963. Pp. 238. Price 3s. 6d.

Few students (or their teachers) could fail to profit from careful reading of this wide-ranging discussion of study behaviour. It does not break new ground in the sense that no previous publications dealing with the various topics have been available. It does, however, bring together in a comprehensive and readable way a large amount of information and advice at a very modest price. It covers more aspects of the student's task than has been done by some of its predecessors. Thus in addition to the customary discussion of motivation, health, physical environment, learning, remembering, reading, note-taking, and examination techniques, there are useful chapters on thinking, group discussion and group work, the writing of English, and simple mathematics. (It is intended for students of arts, sciences and technologies). Compared with some other works of its kind, it has the merit, from the point of view of students in this country, of an adult approach to topics such as the use of study time-tables.

The conclusions reached are based on many years of research by psychologists and educationalists. But as Dr. Maddox himself points out, the impact of a book of this kind depends not so much on its being read as on the extent to which its readers put into practice the recommendations contained in it. Those who are concerned with student progress will be only too familiar with some of the results of failure to take action on what students know to be deficiencies in their approach to study. The chapter on motives and habits does about as much as can be done in writing to help such students to take themselves in hand; and certainly few students could justifiably claim poverty as an excuse for not owning the book. The principal additional matter in some much more expensive texts consists of extensive tests of personal study behaviour. If this book produces in its readers regrets about the absence of tests of this sort, it will have gone a long way towards justifying its existence.

This reviewer has little criticism to offer. He has noticed a few minor errors — for example, 'providing' for 'provided' on page 62; omission of the size of the calorie on page 212 — but these will no doubt disappear in the next edition. Some discussion might then be devoted to problems arising from the restricted range of intellectual capacity among university freshmen compared with that among sixth-formers, and the possible need for consequential readjustment of personal standards; this would introduce the concept of 'average' — a troublesome one for many students. These points hardly detract from the merit of the book as a whole. It can be recommended strongly for personal possession by students in sixth forms as well as by those in universities, colleges of technology or education, staff colleges and other institutions for further education.

DERMOT STRAKER

Report Writing in Psychology and Psychiatry. By JACK T. HUBER. New York: Harper, 1961. Pp. x+114. Price $3.50.

This books sets out to be a 'how-to-do-it' manual on report writing in psychology, psychiatry and related professions.

There are eight chapters, a bibliography and an index: (1) Foundations of report writing (functions of reports, user orientated reports, need for a personality theory, diagnosis, the major thread and how to begin). (2) Formulating the case (outlines, chronological and topological approaches). (3) Outlines for reports in special cases (a general outline, reporting on intelligence, reports for neurologists, vocational guidance and personnel selection reports, psychiatric case summaries). (4) Therapy progress notes (how to take them and what to include). (5) Some notes and what to write (length of reports; the appearance, behaviour and utterances of the patient; use of test data). (6) How to put it in writing (the author discusses clarity, simplicity, the use of qualifiers, value judgments, jargon and style). (7) The dilemma of confidentiality. (8) Some examples of report writing (reports of various types with the author's comments).

The author emphasises that reports should be directed at their users and that they can often be improved by feeding back information from user to writer. We might add, however, that not infrequently reports have to be written for a number of possible users and must therefore be a compromise. When to predict and when not to predict in reports are usefully discussed by the author, but one wonders whether he has perhaps too much faith in the wealth of data that can be culled validly and reliably from many tests. One cannot but welcome the author's emphasis on writing factual reports rather than "elaborate interpretations on minimal data" or reports that purport to be psychodiagnostic but are really little more than client-centred psychotherapy notes. Chapters 2 and 3 are particularly useful to the applied psychologist and his teacher. One likes, above all, the author's emphasis on clarity and simplicity of language and avoidance of qualifying terms that weaken the report. One asks oneself, however, what other terms but "suggest" a psychologist can use when reporting on projection test results.

There are only three pages on report writing in vocational guidance and personnel selection. However, the book is certainly of use to occupational psychologists in its general and practical approach to report writing.

W. G. THOMPSON

The Marianne Frostig Developmental Test of Visual Perception, 1963 *Standardization*. By P. MASLOW, M. FROSTIG, D. W. LEFEVER and J. R. B. WHITTLESEY. Perceptual and Motor Skills Monograph Supplement 2-V19, 1964. Pp. 463-499. Price $3.00.

This monograph presents a description of the Marianne Frostig test, designed to explore children's development in five important and relatively independent areas of visual perception, and to compare the development of normal children with that of children who appeared to suffer from perceptual disturbances. The areas were selected through observation of the difficulties which the latter seemed to demonstrate and which seemed to contribute to retardation in learning. The five sub-tests are of: Eye-hand co-ordination, figure-ground discrimination, shape constancy, perception of spatial position (reversal and rotation) and of spatial relations between points. Several versions of the test were tried out, and it was finally standardized on 21,000 mainly middle-class children aged 3-9 years. The standardization is fully described here, and reliability was reasonably satisfactory. As regards validity: There was a regular increase with age of scores on all sub-tests. However, there were correlations of some magnitude between sub-test scores, indicating that the areas tested were not independent. A factor analysis by Corah and Powell has suggested that two main factors are involved in all the sub-tests, intelligence and general perceptual development. But a more intensive and insightful psychological analysis is needed to discover the significance and inter-relationship in perceptual development of the various types of performance tested.

Some evidence is cited as to the inferior performance on the test of backward readers and slow learners with possible neurological impairment. But more detailed and systematic evidence than any given here is required to establish the value of the test as a diagnostic instrument, and to prove that it is in any way superior to, for instance, the Bender Gestalt test.

M. D. VERNON

Handbook of Counseling Techniques. Edited by ERNEST HARMS and PAUL SCHREIBER. Oxford: Pergamon Press, 1963. Pp. vii+506. Price 84s.

Problems in Vocational Counseling. By L. H. LOFQUIST and G. W. ENGLAND. Iowa: Wm. C. Brown, 1961. Pp. xxii+186. Price $3.50.

Harms and Schreiber have attempted to provide 'a map and guide' to the 'vast and relatively uncharted territory that counselling in its branches represents'. It falls into five main sections, concerned respectively with children and youth, family and community, employment and vocation, religions, and special problems (including medical social work and delinquency). So vast indeed is their territory that they have included amongst their counsellors the doctor advising an expectant mother, the nurse reassuring an apprehensive patient, the lawyer interviewing his client, and even the mediator intervening in a labour dispute. Important as it is for such workers to possess sympathy, insight and skill in assessment and communication, one would not normally conceive their major role as counselling.

Besides attempting to cover too much ground, the book with 36 contributors, suffers from some of the defects of multiple authorship. The contributions vary greatly in length and value from useful and well-documented summaries to articles which might have appeared in the Reader's Digest. Amongst the former are Professor Rothney's down-to-earth and sensible chapter on university counselling ('The Faculty Advisor') and Professor Usdane's comprehensive survey of rehabilitation. Dr. Fenton describes the progressive methods of group counselling used in Californian prisons; and Dr. Korn, in his chapter on young offenders, is one of the few contributors who offer any comparison between counselled and control groups or grapple with the problem of criteria — how to evaluate the outcome of counselling or treatment.

British workers in guidance will find two chapters of special interest in giving the American views of educational and vocational counselling, contributed by Dorothy Sebald and Jane Culbert respectively. These are descriptive rather than analytical. Unfortunately neither gives any references, though there is a brief list in Marguerite Coleman's summary of practices in the employment services.

The technical editing is poor. Though most chapters have a 'bibliography' or list of references, these lists are given in many different formats, and are often inaccurate or out of date. They frequently exclude references cited in the text or the footnotes, and include others which have not been cited.

The small book by Lofquist and England is by now well known amongst the growing number of workers in vocational and educational guidance in Britain. It is far more concerned with techniques than Harms and Schreiber, despite their title. Taking a single field of guidance, Lofquist and England have concentrated on a number of key topics. These include, for example the questions of criteria and control groups; test reliability; report-writing, sources of occupational information; the use of expectancy tables; and work with the disabled. The authors have drawn on standard texts and important papers in journals. Each topic is dealt with clearly and briefly in two or three pages, and is followed by questions for discussion and comments.

The well-chosen references (including some British work) make the book valuable both for the teacher and the student. Though a basic knowledge of psychological techniques and statistics is assumed, the teacher interested in careers work and the youth employment officer also are likely to find much of value in the book.

FRANK SNEATH

Readings in Psychological Tests and Measurements. Edited by W. LESLIE BARNETTE, Jr., Homewood, Illinois: Dorsey 1964. Pp. xi+354. Price $3.00.

This paperback is a collection of 48 articles published in the U.S.A. during the years 1946 to 1962 (with the exceptions of 1948 and 1952), the modal year being 1958 with eight papers. "Only a very few articles are here presented as they originally appeared; most have been . . . abbreviated in one way or another." They are grouped in eleven sections: general measurement problems, test administration problems, norms, response set, reliability, factor analysis, validity, intelligence, personality, interests and critiques of testing. These are followed by a bibliography of works referred to in the text, a subject index and an author index. The validity section is the largest with seventeen papers, the others vary from two to five papers. Preceding each article is an editorial introduction in which the background and issues are discussed and sometimes reference is made to papers related to the topic.

Although intended for 'the undergraduate psychology major whose knowledge of statistics is modest' it is hoped that this book will be read by a wider public especially by people without a strictly psychological background who are engaged in testing, for example, selectors in industry. If some of the papers, that by Warbois for instance, require a firm grasp of statistical techniques, this should not deter the statistically naive as other articles relating in particular to measurement, criteria and validation studies fruitfully complement the standard testing texts without stressing statistics. Humour too is present.

Readers on this side of the Atlantic might have welcomed the inclusion of some British authors. Spearman, admittedly, is mentioned occasionally, but it might have been useful in one of the introductions in the factor analysis section to have contrasted the Primary Mental Abilities approach with the hierarchical theory of human ability. Nevertheless British workers in the field of mental testing will find the collection as it stands valuable in clarifying the problems and difficulties involved in psychological measurement. This volume would be a worthy addition, for example, to the personnel officer's bookshelf; how lasting a contribution he will find it is, however, another matter. The review copy fell apart on the first reading.

JAMES DODD

Annual Review of Psychology, Volume 16, 1965. Edited by P. R. FARNSWORTH. Palo Alto, California: Annual Reviews, Inc., 1965. Pp. ix+571. Price $9.

The 1965 *Annual Review* has several contributions likely to engage the attention of occupational psychologists. One is Simon Biesheuvel's chapter on 'Personnel Selection'; and another is the chapter on 'Psychological Aspects of Ageing in Man' by Sheila M. Chown and Alastair Heron. Biesheuvel, who left the National Institute for Personnel Research some time ago, is still in South Africa, but he seems to have been able to collect a good deal of information about work in progress in other parts of the African continent. It may be doubted whether he is as critical of some of it as he should be (for example, he deals very gently with some of the surprising things done by Schwarz; and he appears to be too ready to accept the criteria used for validation purposes by Vant); but his reporting and comment could probably not have been provided by anyone else. Perhaps he was so determined to cover the ground that he had little space left for argument on major personnel selection issues.

Chown and Heron, both formerly of the Medical Research Council's Unit for Research on Occupational Aspects of Ageing, have written a splendidly thoughtful and well-documented contribution. They draw attention, *en passant*, to the fact that most of the important recent papers on gerontology have been published at least twice—once in a psychological journal for the benefit of psychologists who do not read gerontological journals, and once in a gerontological journal for people in other disciplines who are unlikely to read psychological journals. This practice is growing in other fields and has much to commend it, though it runs counter to the conventions adopted by some editors. Of course, it is not exactly new: in 1947 Sir Frederic Bartlett's Oliver-Sharpey lectures on the measurement of skill were published in the *British Medical Journal* and in *Occupational Psychology*.

The chapter by D. W. Twedt on 'Consumer Psychology' is interesting and useful. It is also, in parts, entertaining. After telling us that some things are 'unblinkably clear,' he finishes with a quotation from a 17th century Spanish monk who was obviously born 300 years too soon: "To be of worth, and to know how to show it, is to be worth double." This comes from Baltaser Gracian's *A Truthtelling Manual and the Art of Worldly Wisdom.*

In a chapter called 'Human Abilities', which takes the place of what the *Annual Review* used to label 'Individual Differences', G. A. Ferguson covers a four-year period. His report has on the whole a decidedly factor-analytic flavour; and for those who are after a fairly up-to-date statement of what Cattell and others are thinking, and why they are thinking it, it will undoubtedly prove welcome. There is more about Cattell in W. H. Holzmann's chapter on 'Personality Structure'.

The *Annual Review* is still mainly an annual review of American literature. It knows the name Eysenck, of course.

ALEC RODGER

The Sixth Mental Measurements Yearbook. Edited by OSCAR KRISEN BUROS. Highland Park, New Jersey: the Gryphon Press, 1965. Pp. xxxvi+1714. Price $32.50.

To many people in the test world the name 'Buros' (it rhymes with 'furrows') is a household word and the appearance of a new edition will not come as any surprise. An edition appears every five or six years and one is about due now. The Sixth Mental Measurements Yearbook contains details of about twelve hundred tests and is arranged and indexed in the same way as its predecessors.

Readers who have not previously met 'Buros' may be interested in a brief description. Each edition is a very large book. It is a quarto volume of nearly two thousand pages; that is, it is ten inches by seven and about three inches thick. More than half the book consists of information about tests that have appeared during the five or six years prior to publication or additional information about older tests. There is a very full description of each test and reviews by one or more authorities. About a quarter of the book consists of a bibliography of psychometric books that have appeared during this period with reviews of many, but not all, of them. Most of the remainder of the book consists of four indexes. There is an index of publishers, an index of titles (books or tests); an index of names (authors of books or tests, or reviewers), and an index of tests classified by the attribute tested. Despite its size the indexes make it an easy book to use.

D. F. VINCENT

Other Books Received

Labour Mobility. By G. BEIJER. National Rural Manpower Adjustment to Industry. Report number 3. Paris: O.E.C.D., 1965. Pp. 116. Price 15s.

Sigmund Freud in Ubersetzungen. By HANS W. BENTZ. Frankfurt on Main: Hanz W. Bentz, 1961. Pp. xi + 60. Price DM 16.80.

Mixed Standard Scale: A New Merit Rating Method. By FRIEDRICH BLANZ. Helsinki: Institute of Technology, 1965. Pp. 155.

Achieving Balance Between Capacity and Sales. By the BRITISH PRODUCTIVITY COUNCIL. London: British Productivity Council, 1965. Pp. 31. Price 15s.

Speech and Language. Therapy with the Cerebral Palsied Child. Edited by WILLIAM T. DALEY. Washington: The Catholic University of America Press, 1965. Pp. ix + 202. Price $2.95.

Plant Union-Management Relations: From Practice to Theory. By MILTON DERBER, W. E. CHALMERS and MILTON T. EDELMAN. Illinois: University of Illinois, Institute of Labor and Industrial Relations, 1965. Pp. x + 179. Price $4.75.

Manual of the Junior Eysenck Personality Inventory. By SYBIL EYSENCK. London: University of London Press, 1965. Pp. 15. Price 3s.

Manual of the Gibson Spiral Maze. By H. B. GIBSON. London: University of London Press, 1965. Pp. 12. Price 4s. Test Card 4d.

Industry and Social Life. By EDWARD GROSS. Dubuque, Iowa: Wm. C. Brown, 1965. Pp. xii + 172.

Essential Facts on the British Foreman. By ANTHONY HAMBLIN, KEITH THURLEY and DOLORES VOON. Birmingham: Institute of Industrial Supervisors, 1965. Pp. 71. Price 7s. 6d.

A Guide to First Degree Courses in U.K. Universities and Colleges. By MARIAN HOBSON. C.R.A.C. Course Comparison Bulletin number 6. French. Cambridge: C.R.A.C., 1965. Pp. 20. Price 4s.

The Spiral After-Effect. By HARRY C. HOLLAND. London: Pergamon, 1965. Pp. xii + 128. Price 35s.

Selection for Secondary Education in Southern Rhodesia. By S. H. IRVINE. Salisbury: University College of Rhodesia and Nyasaland, 1965. Pp. viii + 35. Price 7s. 6d.

Women Workers: Working Hours and Services. By VIOLA KLEIN. Paris: O.E.C.D., 1965. Pp. 100. Price 15s.

Psychology in Industry. By NORMAN R. F. MAIER. 3rd edition. London: George G. Harrap, 1965. Pp. xiv + 718. Price 50s.

Studies in Management Education. By JOHN B. MINER. New York: Springer Publishing Company, 1965. Pp. vii + 63. Price $7.50.

Journey Through Adolescence. By DORIS ODLUM. London: Delisle, 1965. Pp. xi + 183. Price 7s. 6d.

Small Social Groups in England. By MARGARET PHILLIPS. London: Methuen University Paperbacks, 1965. Pp. 318. Price 15s.

Professional Employees. A Study of Scientists and Engineers. By KENNETH PRANDY. London: Faber and Faber, 1965. Pp. 197. Price 32s. 6d.

Juvenile Delinquency. Research and Theory. By HERBERT C. QUAY. New York: D. Van Nostrand, 1965. Pp. ix + 350. Price 55s.

Thinking About Thinking. By JOAN WYNN REEVES. London: Martin Secker and Warburg, 1965. Pp. 333. Price 55s.

Freud: The Mind of the Moralist. By PHILIP RIEFF. London: Methuen, 1965. Pp. xxiii + 397. Price 18s.

Personal and Organizational Change Through Group Methods: The Laboratory Approach. By EDGAR H. SCHEIN and WARREN G. BENNIS. New York: John Wiley, 1965. Pp. x + 376. Price 62s.

Office Automation, Administrative and Human Problems. By W. H. SCOTT. Paris: O.E.C.D., 1965. Pp. 103. Price 15s.

Work and Mental Illness. By O. G. SIMMONS. New York: John Wiley, 1965. Pp. x + 271. Price 55s.

Laboratory Experience in Psychology. A First Term's Work. By B. BABINGTON SMITH. London: Pergamon, 1965. Pp. xxiv + 240. Price 25s.

Workers' Attitudes to Technical Change. Acceptance and Resistance (abridged version). By ALAIN TOURAINE. Paris: O.E.C.D., 1965. Pp. 116.

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Modes of Thinking in Young Children. By MICHAEL A. WALLACH and NATHAN KOGAN. New York: Holt, Rinehart and Winston, 1965. Pp. viii + 357. Price $8.00.

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NUMERO SPECIMEN SUR DEMANDE